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Agriculture

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Volume LXVII Number 11

Bringing in the feed

Published for the Ministry of Agriculture, Fisheries and Food
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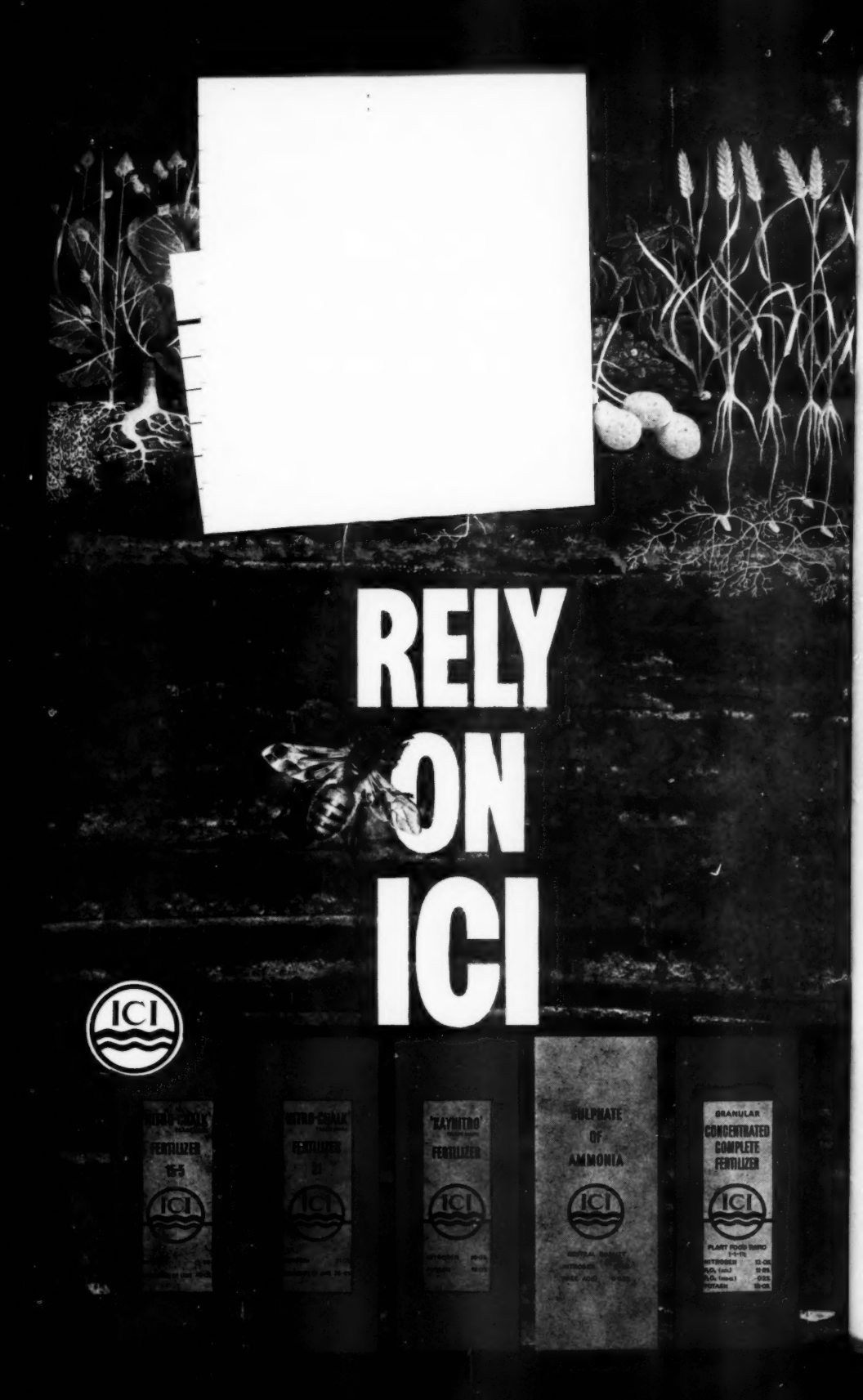
ONE SHILLING MONTHLY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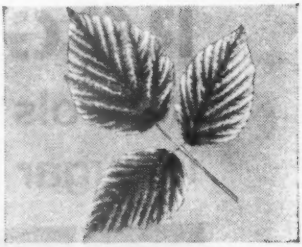
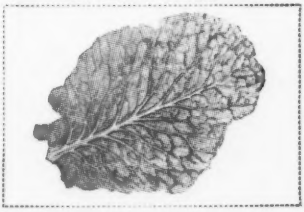
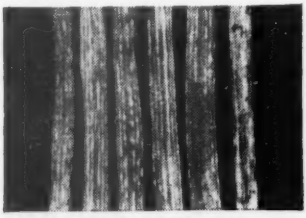


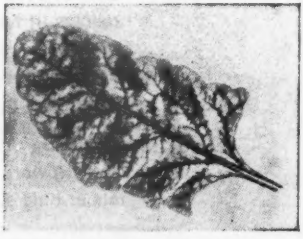
Raspberry Leaves, illustrating deficiency of manganese. Chlorosis begins near the leaf margins and progresses between the veins towards the midrib in a V-shaped pattern.



Cabbage (Savoy), illustrating deficiency of manganese. Severe interveinal chlorotic marbling and necrosis of the leaves.



Oat Leaves, illustrating deficiency of manganese ('grey-speck'). Grey streaks and stripes of chlorosis (loss of colouring).



Sugar Beet Leaf, illustrating deficiency of manganese ('speckled yellows'). Leaves of affected plants tend to be erect, triangular, with margins curling upwards.

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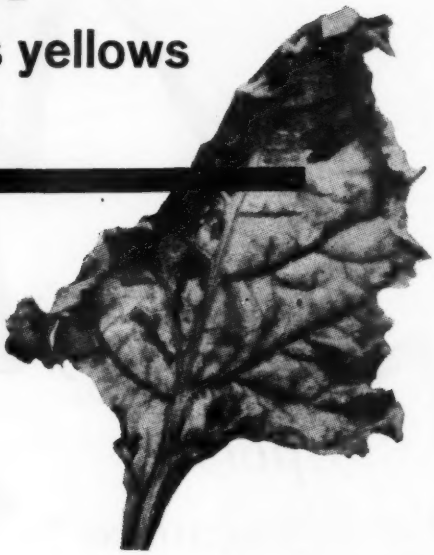

protection Virus yellows disease causes serious reduction in sugar beet yields. It is transmitted to the crop usually in May and June, by greenfly. Timely protective spraying with Rogor 40, however, will control Virus Yellows, because it kills greenfly by contact and, by absorption into the sap stream of the sugar beet, gives continuous control for 10-14 days. By spraying as soon as the first insects are seen the crop is kept free of greenfly and the early establishment of virus yellows disease is prevented.

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yields In areas where virus yellows disease is prevalent, sugar beet growers can expect a loss of at least one ton per acre. Valuing this at only £6 per ton, the saving by using Rogor 40—at just over £1 per acre—is in the region of £5 per acre. *Fisons for good farming*

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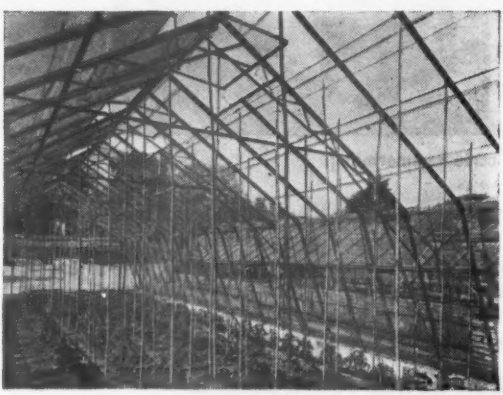

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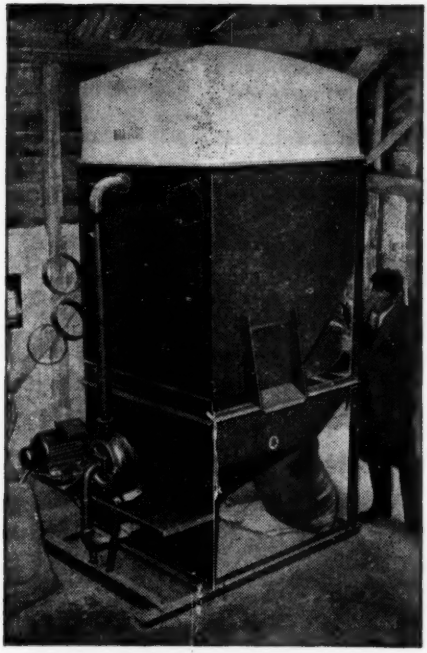
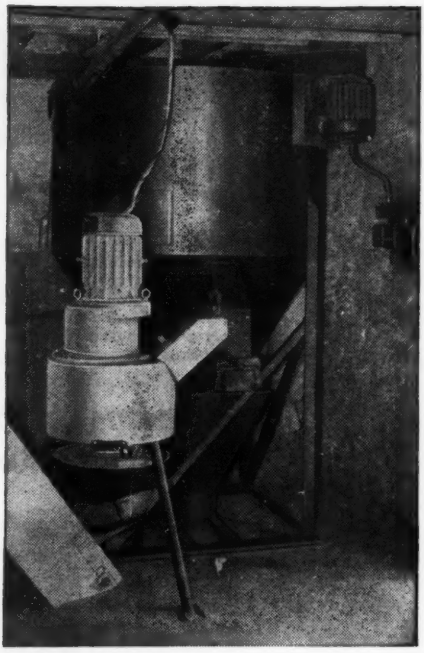


Electric Hammermill



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Issued by the Electrical Development Association

Agriculture

Volume LXVII Number 11 February 1961

EDITORIAL OFFICES
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Fisons 40 Range compounds for sugar beet

Probably more is known about growing sugar beet than about any other crop, and the fertilizer requirements in particular have been investigated in a very large number of field trials. Most of this work has been carried out by Rothamsted Experimental Station working closely with the British Sugar Corporation, and from the results of these trials it is possible to give fertilizer requirements for the main areas in which the crop is grown.

In the absence of kainit or salt, plant food requirements are 1.0 to 1.2 cwt N., 0.5 cwt P_2O_5 and 1.5 cwt K_2O.

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Better Seeds: Better Crops

L. C. GASKELL

Ministry of Agriculture, Fisheries and Food

The Biennial Conference of the National Institute of Agricultural Botany was held at Cambridge on 13th—14th December, 1960, taking as its theme the Institute's motto "Better Seeds: Better Crops".

SEEDS are fundamental to agricultural production: the better the seed the bigger the crop and the better its quality. Recognizing this, and conscious of the many and increasing millions of people who spend their lives undernourished and underfed, the Food and Agriculture Organization has designated 1961 as International Seed Year, and invited member countries to take part in a world-wide campaign to promote the use of better quality seed and so make a vital contribution towards increasing the world's food production.

British farmers are infinitely more fortunate in matters of seed quality than many who farm elsewhere, and for this their thanks are due largely to the National Institute of Agricultural Botany, Cambridge. Since its foundation in 1919, the Institute has promoted the improvement of existing varieties of seed in the United Kingdom and helped the introduction and distribution of new varieties. That at the last count only 3,700 of those who live by seeds thought it worth while to be Fellows of the Institute, and to receive direct the very valuable results of its investigations, hardly reflects the value of the Institute and the service it renders.

What is news in seeds—the achievements, the problems—was reported to, and animatedly discussed by, some 400 Fellows of the Institute at the Biennial Conference at Cambridge in December.

The Conference served also as the curtain-raiser to the 1961 World Seed Campaign in this country. PROFESSOR H. G. SANDERS, Chief Scientific Adviser (Agriculture) to the Ministry of Agriculture, referred in the opening speech to those "gruesome graphs" which forecast a doubling of the world's population by the end of the century and the consequent increased demand for food. The World Seed Campaign will be an important item in FAO's immense task of relieving world hunger. "It is not sufficient", said Professor Sanders, "to provide free food to the under-supplied countries; they must be shown how they can produce it themselves". And for that there can be no more promising approach than seeds—better seed of better varieties. Over the past twenty years in this country, the availability of new varieties and the advances in purity and germination, in which the N.I.A.B. has played such a large part, have greatly contributed to the 30—40 per cent increase in crop yield that has been achieved.

Instruction in seed improvement and analysis

It is fitting, therefore, that with this fund of knowledge the United Kingdom's main contribution to the International Seed Year should be a course of instruction in seed improvement and seed analysis, to be held at the Institute in the summer of 1961. This will enable representatives from the

less developed countries, on their return home, to introduce similar techniques and thereby increase agricultural production in their own countries.

"But", said Professor Sanders, "there must be no complacency at home. Our second aim must be to bring conviction to the unconverted in this country about the value of good quality seed." He did not advocate that money should be squandered even on the highest quality seed, but there is a need to get seed price in proper perspective and, as MR. F. R. HORNE, Director of the N.I.A.B., was later to point out in his end-of-the-day summary, seed, although it accounts perhaps for only 5 per cent of the total production costs, can yet have an immense bearing on the final yield.

Quality was the main theme of the address by MR. J. G. JENKINS, President of the National Farmers' Union of Scotland, giving the British farmer's viewpoint, and he made a formidable list of points for the plant breeder to consider. "Yield, expressed quantitatively, is not everything" he said; "it is immensely important to consider quality too—particularly in potatoes". The incidence of disease is likely to become increasingly important as farming becomes more and more specialized. Can the plant breeder, for example, produce a blight-resistant potato and one less susceptible to the mechanical damage which now accounts for an enormous wastage?

Mr. Jenkins paid tribute to the N.I.A.B. for its seed certification schemes, and thought it fair to remark that their success has been due largely to the part played in England and Wales by the seed merchants and their readiness to accept responsibilities. He suggested that seed merchants might maintain and increase their close contact with their farmer customers for the dissemination of information, and thus supplement the advice given by the official advisory services and the N.I.A.B. leaflets. And he invited less progressive merchants to follow the farmer's habit of looking over his neighbour's hedge to see what could be learned from their more enterprising colleagues.

Still infinite scope for plant breeders

If DR. G. D. H. BELL, Director of the Plant Breeding Institute, Cambridge, was dismayed by the expectations of farmers generally, and Mr. Jenkins in particular, he in no way showed it. "Some", he said, "think that plant breeding is played out", but in his opinion there is still infinite scope. If plant breeders' rights are established, that may provide an inducement where development has hitherto been too limited. But such research really needs a higher level of scientific endeavour in which all branches of associated knowledge can be brought in contact with the plant breeder. He looked forward to the production of varieties showing ranges of adaptation to conditions and, no less important, to a stabilization of yields by genetically controlled resistance to disease. Subsequently, in reply to a questioner who suggested that the great improvement gained recently by varieties from foreign countries might indicate that breeding to local conditions is a waste of time, Dr. Bell roundly declared that the success of Cappelle does not mean that it is beyond improvement; better varieties than Proctor too can probably be bred for, say, Yorkshire. "The ultimate expression of yield is the refined adaptation to local conditions."

Disease problems and the emergence of new pathogens were also referred to by MR. C. A. ELLIOTT, Head of the N.I.A.B. Trials Branch. Heine VII

winter wheat, which fell before a new race of yellow rust, and Cappelle Desprez, which was formerly resistant to loose smut but now suffers losses due, it is thought, to a new resistance-breaking strain, demonstrate that the resistant variety of today may prove to be one of the susceptible varieties of tomorrow.

In his paper on the importance of crop testing in relation to production, Mr. Elliott said that between 50 and 60 new cereal varieties are received for testing each year against 40 ten years ago. About 30 trials at a wide range of centres and spread over three seasons are held before the variety can be placed before the N.I.A.B. Committee for recommendation. He pointed out that the aim of a crop testing organization must be to find and encourage the use of the best varieties and to discourage the distribution of poor varieties, and he gave extremely interesting estimates of the benefit which has followed the introduction of heavier yielding varieties of barley and wheat. In the case of barley, the introduction and spread of new varieties, particularly Proctor, has from 1940 to 1957 increased the national average yield by 2·8 cwt per acre. In the same period, other factors such as the increased use of fertilizers, chemical weed control, better seed dressings and the use of combine harvesters have accounted for an increase of 3·5 cwt per acre. New varieties now under trial promise a performance comparable to that of Proctor. In the case of spring and winter wheats, the yield increase over the period 1947—1957 due to the adoption of new varieties has been 3·8 cwt per acre, and 2·3 cwt per acre due to all other factors. It was particularly interesting to hear that the increase in winter wheats alone due to variety may be of the order of 5 cwt per acre. It is estimated that at present the difference in yield between spring and winter wheat is about 25 per cent in favour of the latter, but this difference may diminish with the wider adoption of the heavier yielding spring wheats, notably Jufy I.

MR. A. F. KELLY, Head of the N.I.A.B. Seed Production Branch, in his paper on seed certification, called for greater attention to detail by seed growers. In the Cereal Field Approval Scheme, the rejection level has over the past thirteen years remained at about 30 per cent of all crops inspected. But of these rejections only a small proportion are because of varietal impurities. The majority are because of weeds and the presence of other cereals in the crop. Greater care would avoid this unnecessary wastage and might well mean the production of "field approval" seed more cheaply and in greater quantity. He also pleaded for more variety-consciousness by the user of herbage seeds, and he urged seed merchants to help the N.I.A.B. and the N.A.A.S. in making the farmer better informed in the selection of varieties for sowing. Seed certification for herbage is developing internationally and may well lead to the opening of new areas for the production of seed difficult or impossible to grow in northern Europe. Hitherto development in this direction has only progressed on any scale in parts of the United States; an alternative area in southern Europe might provide healthy competition which would benefit our own farmers.

The expansion and increasing complexity of the work of the Official Seed Testing Station were apparent from the paper by its Chief Officer, DR. P. S. WELLINGTON. To mention but one, the extra accommodation provided by the new building has made it possible to double the size of the training courses available for seed analysts from private firms. These facilities—and Dr.

Wellington—will contribute in the course to be made available next summer to the representatives from the less developed countries.

The second day of the Conference was devoted to "Quality in Potatoes". MR. J. E. RENNIE, Chairman of the Potato Marketing Board, was able to report that potato consumption in this country has not fallen to the extent it has in other countries but he left no one in doubt of the industry's many requirements. Important amongst these, he said, is much more mechanization to cut out expensive hand labour, and that in turn means a potato which can stand up to these machine operations without resultant damage. It is important too for the industry that there should be better utilization on a more economic basis of the rejects that inevitably arise. The housewife should be educated to ask for the variety she likes and to have that choice available to her so that she thereby sets up a chain reaction through to the grower. Perhaps intentionally Mr. Rennie left unmentioned the one who surely is the final stage in such a reaction, the breeder, to whom, as to the alchemist of old, all seem to turn for a variety to meet all their requirements. Subsequent speakers, both from the platform and from the audience, bore witness to the considerable thought and the immense amount of meticulous work that goes on behind the scenes towards the production of what is a major and yet relatively humble item in our diet.

The abiding impression provided by the Crop Conference was that seeds—including emphatically seed potatoes—are rapidly becoming an exact science. If there are those who regret in this increased precision the elimination of what may be the poetry and the character of nature, let them remember again the World Seed Campaign and its aim to help fill the mouths of those who now go undernourished and underfed. There lies the real justification and the reason why the campaign's lesson should be kept in mind, not only in 1961 but continuously.

Scholarships in Farm Management

The Frank Parkinson Agricultural Trust has established six scholarships to enable suitably qualified persons to follow the one-year post-Diploma and post-Graduate Courses in Farm Management at Seale-Hayne Agricultural College, Newton Abbot, Devon. Details and conditions of the scholarships are obtainable from the Secretary to the Trust, 45 Bloomsbury Square, London, W.C.1.

Hop Research and Recent Developments in Hop Growing

H. S. DARLING, M.AGR., PH.D.
Wye College, Ashford, Kent

Once regarded as "a wicked weed", the hop is now a plant upon which full-time scientific research is centred.

IT is in times of change that research often makes its most effective contributions to the industry with which it is associated. From this viewpoint the 1959 report on hop research at Wye College[1] makes interesting reading, for a major change is taking place quietly and undramatically in the English hop industry. This change, recently discussed by Lt.-Col. F. N. Richardson,[2] is a sharp decline in the production of Fuggle hops.

For half a century the Fuggle has been the staple variety of the English hop industry. Originating as a chance seedling in 1875, it proved acceptable to brewers and gained steadily in popularity until it was the main variety cultivated in England. It is an easy hop to grow, being less demanding than many other varieties in respect of quality of soil and management and having appreciable field resistance to downy mildew disease (*Pseudoperonospora humuli*). In 1950 it occupied 78 per cent of the national hop acreage.

During the last ten years the importance of the Fuggle has fallen sharply, and in 1960 it represented little more than 60 per cent of English hop production. The evidence suggests that this downward trend will continue. It should be emphasized that the Fuggle is still popular with the brewers and this decline is not due to reduced market demand. As pointed out by Lt.-Col. Richardson, the two main reasons for the drop in Fuggle production are the spread of progressive *Verticillium* wilt and the increase in mechanical harvesting.

Of these two factors, progressive wilt is slightly the older. It is a soil-borne fungal disease which originated in the Weald of Kent in 1933 and is lethal to the Fuggle and most other popular commercial varieties. In spite of strenuous efforts to confine the disease to already infected areas, wilt has spread to such an extent that the Fuggle can no longer be grown economically on many farms. Growers are being forced to cultivate wilt-tolerant varieties which, though not fully acceptable to the brewers, have a measure of field resistance to the disease.

Mechanical hop picking began as a commercial practice in England in 1935 but made little headway until shortages of casual labour from 1950 onwards forced increasing numbers of growers to install picking machines. In 1960 more than 70 per cent of the English crop was mechanically harvested. The Fuggle, with its soft loose cones, its long easily broken lateral branches, and its tendency to grow into a tangled head, has proved to be an unsatisfactory variety for machine picking. This has led many growers to look for more suitable varieties for this purpose.

These two factors, which have so seriously affected Fuggle production, are directly or indirectly involved in most of the lines of hop research in

progress at Wye College. No proven measures for the control of progressive wilt have yet been developed. The only solution to the problem at present available is the use of wilt-tolerant varieties with their ability to survive and crop economically on infected land. As suggested above, none of the tolerant varieties now in commercial use is regarded by the brewing industry as an adequate substitute for the Fuggle.

Search for a substitute for the Fuggle

Plant breeders at Wye College have undertaken the task of producing a wilt-tolerant replacement for the Fuggle, and this work is being carried out in collaboration with East Malling Research Station, which is responsible for investigations on the wilt fungus itself. The two research teams have jointly produced a series of highly tolerant seedlings, of which three are now on farm trials in the wilt area of the Weald of Kent. These seedlings have been carefully selected for desirable cultural features and have been thoroughly screened by experts in the hop trade in respect of aroma and other physical qualities. They have also passed successfully in small-scale brewing trials carried out by the Brewing Industry Research Foundation. During their farm trials they will be grown, picked and dried to standards laid down by a special committee of the Hops Marketing Board, and the resulting hops will be used for large-scale brewing trials carried out by a number of brewers throughout the British Isles. It is hoped that by 1965 at least one of these seedlings will have proved itself sufficiently to merit general acceptance by both brewers and growers.

The onset of progressive wilt and the decline of the Fuggle has resulted in a large and as yet unsatisfied demand for planting material of other varieties, especially those that are wilt-tolerant. This demand has focused attention upon propagation methods, and here Wye has made and is making a valuable contribution by research on the application of mist propagation to hops. This work is proving markedly successful and has made possible the rapid multiplication of desirable material by rooting small green cuttings quickly and efficiently under controlled environmental conditions. The application of this technique to hops was originally undertaken to provide uniform batches of rooted cuttings throughout the year for use in replicated experiments; it has already greatly facilitated many lines of research, including investigations on progressive wilt at East Malling.

Mist propagation is now proving of interest to commercial hop propagators, and a number are already using it. Current work in this connection at Wye is concerned with establishing the best method of adapting what is in fact an intensive glasshouse technique to the annual cycle of a farm crop. It has been shown that green cuttings rooted under mist in April, May, and even June and subsequently grown on in a nursery garden will develop sufficiently by the autumn to ensure rootstocks as large as bedded setts produced in more traditional ways.

Scourge of downy mildew

As mentioned above, an attractive feature of the Fuggle variety is a measure of resistance to downy mildew. This disease is a major problem to

growers, for not only can it cripple and destroy the herbaceous annual growth of the plant, it can also kill the rootstock. Standard control measures include frequent applications of expensive fungicides and laborious removal by hand of infected shoots and leaves. Ceaseless vigilance is necessary throughout the growing period, since the cones are very susceptible to infection and carelessness at the end of the season may result in the loss of much or all of the ripening crop.

Most of the newer varieties now being used as Fuggle replacements are highly susceptible to downy mildew, and this is forcing growers to pay increased attention to this serious disease. Research at Wye is developing two lines of approach to the problem. The first is the breeding of resistant varieties. Such work has been in progress in Germany for a number of years and shows considerable prospect of ultimate success. Through the kindness of Professor Zattler of the German Hop Research Institute at Hüll near Munich, Wye has obtained hop seedling material which is highly resistant to downy mildew, and is now using it in breeding work. It must be realized, however, that this is long-term research and that it will be 12-15 years before resistant varieties can be produced which are adapted to English conditions.

The other approach to the problem concerns the annual cycle of the disease. In spring, the first signs of attack are infected primary shoots known as basal spikes. Spores from these infect other growth and so begin the downy mildew cycle for the year. The origin of these primary basal spikes has long remained a mystery. The commonly accepted theory on the Continent and in the U.S.A. has been that developing buds are infected by winter spores (oospores) of the fungus in the soil surrounding the rootstocks. Work at Wye has so far failed to show that winter spores, though produced in large numbers, are of importance in the cycle of the disease; indeed these spores have never been observed to germinate under English conditions. The Wye research, however, has discovered that the fungus can overwinter as a vegetative mycelium in the rootstock, and that this mycelium can infect the buds from which the next season's bines will develop. It seems highly probable that the primary basal spikes each spring are caused by the growth of buds infected in this way, and it is hoped to obtain conclusive evidence on this point in the near future.

Meanwhile efforts are being made to break the annual cycle of downy mildew by preventing rootstocks from becoming infected. Current research at Wye suggests that regular applications of Bordeaux powder during the growing season to the crowns of clean rootstocks will largely prevent the entrance of infection. This work is being continued and extended to include trials with other fungicides.

Machine picking and physiology of the crop

The problems of machine picking may differ from those raised by progressive wilt but they are equally important and far-reaching in their implications. In spite of much research, no mobile machine has yet been developed which will harvest the crop in the field and leave the picked bines still attached to the rootstocks. All machines now on the market are stationary models which are housed at some central point on the farm and to which bines cut from the rootstocks are conveyed for picking.

In the nineteenth century, when hops were grown on poles, it was common practice to cut the bines when harvesting to facilitate the work of the hand pickers. It was then recognized that such cutting could weaken the plants, sometimes seriously, but the precise reason for this remained unknown. The recurrence of the practice of bine cutting in machine picking has once more drawn attention to this undesirable effect, and this is now under investigation at Wye College and by members of the Ministry of Agriculture staff at Rosemaund Experimental Husbandry Farm.

The harmful effect of cutting the bines would appear to be due mainly to the loss of starchy food material. Experiments at Wye have shown that during September and October, once the cones have developed, the hop plant uses its remaining photosynthetic leaf area to store up extensive reserves of carbohydrate food material in its rootstock. These reserves maintain the dormant plant during the winter and then feed it while it makes its characteristic rapid growth in the spring and early summer. During July and most of August, the starch produced by the new leaves is used as fast as it is formed to provide energy for the development of the crop. It is not until late August or early September that food reserves once again begin to accumulate in the rootstock. Normal hand picking of the cones leaves a large proportion of the leaves on the bine which remains attached to the rootstock; photosynthesis and the accumulation of food reserves can therefore continue until shortening days and falling temperatures bring all activity to a standstill.

The hop plant has, in fact, an annual cycle in the storage and utilization of its food reserves, and each year the main structure of its growth above ground is established by means of food stored in the previous autumn. Cutting the bines in September for the picking machine breaks this cycle and reduces the amount of reserve carbohydrate available to the plant for growth in the following spring. If cutting the bines is delayed until late September, the loss in food reserves may not be serious; but if harvesting takes place early in the month, weakening of the rootstock often occurs, with consequent loss in yield.

Investigations at Wye and Rosemaund are being pursued with the objects of first, determining as precisely as possible the nature and extent of the effects caused by cutting the bines at different times during September; and second, developing cultural techniques which will ensure that when the bines are cut, sufficient functional leaf area remains on the plant to build up adequate reserves in the rootstock.

Pointers to seedless cones

Mechanical harvesting also creates problems, in that the picking machine is more exacting than the hand picker with regard to the type of growth necessary for the best results. As mentioned earlier in this article, the variety Fuggle is unsuited for machine picking by reason of its soft loose cones, its long easily broken laterals and its tendency to form a tangled head of growth in which the cones are inaccessible to the picking loops of the machine. It has been found that many of the varieties bred at Wye by the late Professor Salmon are better for machine picking than the Fuggle. In addition to a more suitable growth pattern and bine structure, varieties such as Northern

Brewer, Bullion, Pride of Kent and Bramling Cross have firm, dense cones which do not shatter easily in the machine and which separate readily from the leaf and stem residues in the cleaning mechanisms.

It has also been found that seedless cones are firmer and denser than seeded cones and so pick better on the machine. Current plant breeding work at Wye, by making use of polyploid techniques, may be expected to enhance the desirable qualities of existing varieties by producing triploid derivatives that bear cones with greatly reduced seed content when grown under English conditions of full pollination. Such triploid varieties have been found to pick well on the machine and should give a more satisfactory yield than would be obtained by growing the diploid parent in the absence of pollen to ensure seedless cones. A triploid seedling of Bullion has recently been sent out from Wye for farm trials.

This factor of seed content may also prove to be important in view of the current demand in England for lager-type beers. The process of lager brewing differs considerably from that used in most English breweries, and the differences include a marked preference for seedless hops. English hops, with their high seed content, while suited for traditional British top-fermented beers are not liked by lager brewers, and seedless Continental hops are at present being imported for this process. It is hoped that triploid varieties bred at Wye may enable the grower to produce hops of low seed content under English conditions which will satisfy the needs of local lager brewers.

Height and spacing of the crop

Besides choice of variety, the grower by the management of his crop can influence its performance in the picking machine. American experience has shown that the height and spacing at which the plants are grown are factors of major importance, and these have been investigated at Wye in recent years. As far as yield per acre is concerned, increase in height is more important; wider spacing reduces yield. The evidence available suggests that increase in height is desirable up to an optimum for each variety. Varieties of moderate vigour such as Northern Brewer have yielded best at Wye on 16 feet wirework, while strongly growing varieties such as Bullion require wirework at 18 feet or possibly higher.

This work on height and spacing is now being extended to include growth studies and detailed research on related performance in the picking machine. Results from these new investigations, in which the National Institute of Agricultural Engineering is collaborating, are not yet available but may be expected to be of considerable practical interest and use to growers.

Many growers are raising the height of their wirework to improve the performance of their picking machines. In 1960 an unusually large number of wirework systems collapsed under the stresses imposed by a wet and stormy season with heavy bine growth. The National Institute of Agricultural Engineering are collaborating with Wye College in research on the factors affecting the life and performance of wirework systems; data are being accumulated which should eventually replace much of the guesswork which has hitherto guided growers in the erection of their wirework.

The English hop industry has long been screened from major changes by the conservative attitude of the British brewers. A wind of change is now

blowing, over which neither growers nor brewers have much if any control. It is at such a time that the hop industry may justifiably look to the application of scientific knowledge for guidance and help. It is encouraging to know that the research teams at Wye, East Malling, the N.I.A.E. and Rosemaund are aware of this challenge and are eagerly playing their part.

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Some Variations in Beef Production Costs

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The authors discuss the value of weighing cattle from time to time to assess the amount of live weight gained on various feeding regimes. They compare beef production costs on a Norfolk arable farm with costs on other farms.

BEEF cattle may be bought or sold at any stage of production from the calf to the strong store or fat beast. To maintain a profitable beef enterprise, therefore, it is essential for farmers to know the weight of their cattle at any particular stage, and have an accurate idea of the liveweight gains that are possible under different systems of feeding and management. They must also know the probable cost of such gains. In many markets nowadays store cattle are sold over a weighbridge, but on most farms the weights of cattle are still estimated by eye, and the accuracy of that judgment will depend very much on personal skill. There is a grave lack of information on the costs of production in relation to the gains made during different periods in the production of beef cattle. This renders it difficult to make any constructive changes in the system of rearing or feeding on individual farms.

In 1957 a survey of beef production as a by-product of dairying was started in East Anglia, to widen the scope of research work on beef production already in progress at Cambridge. Groups of Friesian, Shorthorn and cross bred steers were weighed at the time of major changes in feeding during their lives (mainly spring and autumn) on nearly forty farms, by means of a portable weighing machine. On a number of these farms the beef cattle were costed by the Farm Economics Branch at Cambridge, and it has been possible to relate the costs of production to the actual gains in weight during the various stages, and to work out the cost in pence per pound of liveweight

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gain. The price of the calf or store can be expressed as a cost per pound live weight, and the marketing of the store or fat beast judged on the same basis. In this article a detailed example is given of beef production and costs on one particular Norfolk farm during the period 1957—1960, and the figures are then compared with the information obtained on some other farms in the survey.

Management of 41 steers on an arable farm

This Norfolk farm was predominantly arable, the main crops being wheat, barley and sugar beet. The soil varied from a loam to a heavy clay, and certain fields were kept in permanent grass. Three- or four-year leys formed part of a flexible rotation. In the past, well grown store cattle were bought for yarding or grazing, but in the autumn of 1957, 42 steer calves, comprising Friesians, Shorthorns and Friesian × Shorthorns were bought in batches at a fortnight old from a West Country dealer. The Friesian calves were bought an average of 6 weeks later than the others. The cost of the calves varied from £12 10*s.* to £13 10*s.*, and averaged 38*d.* per lb live weight for the Shorthorns and crosses and 35*d.* per lb for the Friesians. All the calves were reared for the first 14 weeks on proprietary early weaning foods and hay, and were housed in pens constructed with hurdles in two large loose boxes. At 16 weeks old the concentrate rations of the Shorthorns and crosses were changed to 5 lb per head per day of crushed home-grown cereals balanced with a protein and vitamin supplement. The younger Friesian calves were kept on rearing nuts until turned out to grass. One Shorthorn calf died from a stoppage towards the end of the rearing period.

The older calves were turned out to grass during the day in the last week in April 1958, and the Friesians followed three weeks later. During the summer the 41 calves were grazed over 39 acres of grass, from which cuts for hay, silage and grass seed were also taken. Only a proportion of the total costs, therefore, can be charged for the grazing. From July onwards the calves were fed 2—3 lb barley meal per head daily in troughs, to supplement the lush grass and help them withstand the very wet weather. In the autumn, beet tops were carted to the calves on pasture and they had access to hay in open yards at night.

On 1st December 1958 the farmer picked out twelve stronger cattle that he considered would repay extra feeding, and housed them in one yard, while the remainder of the bunch were housed in another yard. All the cattle were fed a basic ration of 4 lb dried sugar beet pulp per day, and hay, silage and straw. The twelve cattle were given an additional 4 lb fattening nuts per head daily. From the middle of March 1959 onwards, suitable cattle were drawn from both yards for sale in the local fatstock market. Seventeen of the less forward cattle which had been wintered on the basic ration were turned out to grass, and ten of these were sold fat off grass in the early summer. The seven remaining beasts were kept on grass during the summer and were yarded again in the late autumn, with some other store cattle. They were fed on beet tops, hay, straw and 8 lb per head daily of crushed corn and dried sugar beet pulp. These seven cattle were sold fat during the winter. For the purposes of costing, the 41 cattle are allocated to one of four groups according to the method of finishing.

Four groups for costing

Group 1 are the 12 cattle (8 Shorthorns and 4 Friesian × Shorthorns) which were yarded together for extra feeding and were sold fat out of the yard at approximately 18 months old.

The 29 cattle which were wintered on the basic ration in the other yard are divided into:

Group 2: 9 Shorthorns and 3 Friesians which were sold fat out of the yard without extra feeding at 19 months old.

Group 3: 5 Shorthorns and 5 Friesians which were sold fat off grass in the early summer of 1959 at just over 19 months old.

Group 4: 3 Shorthorns and 4 Friesians which spent the summer of 1959 on grass, and were sold fat out of a yard during the following winter at 26—27 months old.

Table 1

Liveweight gains, costs, and returns of the four groups

	Group 1		Group 2		Group 3		Group 4	
	Gain *lb*	Cost/lb *d.*	Gain *lb*	Cost/lb *d.*	Gain *lb*	Cost/lb *d.*	Gain *lb*	Cost/lb *d.*
Calf	(82)	38	(83)	37	(85)	36	(85)	36
	Figure in brackets is average weight at purchase							
Rearing	307	16	280	17	274	16	303	14½
1st summer on grass	310	3	296	3	279	3	280	3½
Yarding 2nd winter	340	26	325	27½	241	33	239	33½
2nd summer on grass	—	—	—	—	87	3	307	4
Yarding 3rd winter	—	—	—	—	—	—	78	38½
Total gain	957		901		881		1,207	
Average cost per lb of total gain		15		16		15½		14½
Average number of days to marketing	538		559		569		797	
Average live weight at market*	1,014		972		957		1,260	
Average daily gain (lb per day)	1·8		1·6		1·5		1·5	
Average price per live cwt†	£9	0*s.* 3*d.*	£9	1*s.* 0*d.*	£9	2*s.* 6*d.*	£7	9*s.* 4*d.*
Average profit per beast‡	£15	18*s.* 9*d.*	£13	6*s.* 5*d.*	£17	3*s.* 0*d.*	£6	14*s.* 9*d.*

The cost per lb gain is correct to the nearest halfpenny.

*Weighed to nearest quarter on market scales. The difference between calf weight plus total gain and market weight is due to loss of gut fill, etc., during marketing.

†Price includes fatstock subsidy.

‡The profit includes all subsidies. The transport charge to market and the selling commission have not been deducted.

It must be emphasized that Table 1 shows the case history of one particular bunch of calves, and is not a comparison of different methods of fattening. The proportion of the breeds varied in the groups, as the farmer was selective in his grouping of the cattle. At the time of yarding the weights of the Shorthorns and crosses ranged from 640 to 860 lb, and the weights of the Friesians from 590 to 685 lb. This variation in weight, together with the stage of maturity of the cattle, influenced the farmer to divide the bunch into four groups so that he could market them to the best advantage.

Worthwhile profit

From the Table it can be seen that the farmer made a worthwhile profit on the beef enterprise. The average profit of £13 17*s.* 10*d.* was, however, mainly accounted for by the calf and fatstock subsidies, which averaged £13 11*s.* The levels of profit of the four groups ranged from £17 3*s.* to to £6 14*s.* 9*d.*, and this difference was due to a combination of the factors of total gain in weight, the cost of that gain and the price received per live cwt. The average prices and subsidies received per live cwt for the cattle in groups 1, 2 and 3 were very similar. The lower figure for the cattle in group 4 was not due to the heavier weight of these cattle, but to the poor auction prices in the local market and the low rate of fatstock subsidy at the time they were sold. From the husbandry angle it is the breakdown of the total gain in weight and its cost into the rearing, grazing, yarding and finishing periods that is of particular interest. It will be noted that within a group the gains in weight at successive whole periods did not differ appreciably, but the cost of those gains varied from as low as 3*d.* per lb for grazing up to 33*d.* for yarding. In consequence the average cost of the total gains made by the groups was influenced by the varying periods spent on grass. This cost fell from 16*d.* per lb for the cattle in group 2, which had spent one summer on grass, to 14½*d.* for the cattle in group 4, which spent two summers on grass. The cattle in group 3 were turned out to grass for 1—2 months before being sold fat, and this short period of cheap liveweight gains helped to reduce the cost of the total gain to the intermediate figure of 15½*d.* per lb. The costs of the weight gains during rearing (from 0 to 6 months) lay midway between the costs during grazing and yarding, and the differences between the groups were not large. On other survey farms it was noticed that food costs during rearing were generally associated with the rate of gain during this period, and that labour and housing charges and the incidence of calf ailments were the factors most likely to affect the cost per pound gain.

The big difference between the cost of putting on weight on grass and during yarding was apparent on all the survey farms, although weight gains and feeding costs varied from farm to farm. The growth made by autumn-born calves during their first summer on grass did not vary as much as one would have supposed from the variety of the management practised on the farms, and the cost per lb gain ranged from 3*d.* to 9*d.* The difference in the rate of gain made by yearlings being wintered in yards was the factor that caused the wide range of 15½*d.* to over 100*d.* per lb liveweight gain during this period. On most farms the cost per lb of weight at the various stages of production was highest for the purchased calf, and was followed by the gains during wintering, rearing and grazing. When the total cost of each stage was considered, the order of magnitude was wintering, rearing (0—6 months), purchase price of calf, and cost of grazing.

Controlling the cost of wintering

The high cost of wintering has aroused much interest in various methods of reducing food and labour costs, such as outwintering on foggage or the self-feeding of silage. Examples of the weight gains and costs of feeding of groups of cattle outwintered on foggage on two farms, A and B, are given

in Table 2, compared with groups 3 and 4 which were yarded on the Norfolk farm already described.

Table 2

Comparison of the cost of liveweight gains of outwintered and and yarded cattle

	Winter			Summer		Total	
	Gain *lb*	Weekly cost per head *s. d.*	Cost/lb *d.*	Gain *lb*	Cost/lb *d.*	Gain *lb*	Cost/lb *d.*
			1-2 months on grass following wintering				
Farm A (Hereford crosses outwintered)	124	13*s.* 9*d.*	38	153	2	277	18
Group 3 (yarded)	241	28*s.* 1*d.*	33¾	87	3	328	25½
			Full summer period on grass following wintering				
Farm B (Friesians outwintered)	25	10*s.* 8*d.*	123	380	5	405	12½
Group 4 (yarded)	239	28*s.* 1*d.*	33	307	4	546	17

On farms A and B the average weekly costs of feeding during the winter were less than half those of feeding groups 3 and 4, but the costs per lb liveweight gain on these two farms were 38*d.* and 123*d.* respectively. These high costs for liveweight gain resulted from the small weight gains during the winter. On two of the survey farms, groups of cattle even lost a little weight when outwintered on foggage with limited supplementary feeding. To judge methods of outwintering completely on the basis of cost per lb gain during the winter would not be realistic. The cattle on farm A and in group 3 were moved on to spring grass for 1—2 months before being sold fat. The cheap gains on grass during this short period resulted in a total gain during the winter and spring of 277 lb at 18*d.* a lb for the outwintered cattle on farm A, and 328 lb at 25*d.* per lb for the cattle in group 3. These figures compare favourably with the gains and costs of groups 1 and 2 which were fattened in yards on the Norfolk farm. The cattle on farm B and in group 4 spent the whole summer on grass, and it is of interest to see how the varying costs and gains affected the cost of the total weight increase during the year. Outwintered cattle and those fed moderately in yards generally made good gains on grass during the following summer. This compensatory and cheap growth on grass often played a valuable role in reducing the total cost of beef production on a farm.

On a number of farms intensive beef production was possible and profitable without turning the cattle out to grass. On certain farms this was possible because there were supplies of cheap arable by-products to take the place of grass which was not available for the beef cattle. The seasons when the by-products were available influenced both the time of purchasing calves or stores and the marketing of the cattle, in just the same manner as summer grazing did on other farms. In the main, the profitability of intensive beef production depended on a high rate of daily liveweight gain which was only possible when the standard of management was above average.

Beef recording scheme needed

However, on most farms the beef cattle go to grass for at least one summer. To obtain the full value from costings and weighings the production methods on the farm have to be examined in yearly periods, to take into account the effect of rearing or wintering on the gains on grass during the following summer. The autumn-born calf going out to grass at about 6 months old fits neatly into such a scheme. The spring-born calf that is reared indoors may be up to a year old before it is turned out to grass, and in this case the initial 18-month period has to be considered. From this initial period onwards there will be considerable variation in the methods of feeding and finishing both autumn- and spring-born cattle. Much depends on the weight and finish of the cattle at this stage, and to be able to plan effectively the farmer must know the weight of his cattle and have a reasonably accurate idea of the cost of future gains in weight under his own conditions. This will involve both the use of a weighbridge on the farm and a simple record sheet, to keep an accurate check of food fed. There is a real need for some form of beef recording scheme to provide this service and information.

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Prospects in the Glasshouse Industry

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Mr. Sheard thinks that a need for more centralized marketing and closer consumer research are only two of the challenges facing the glasshouse industry today, but that if it faces its problems boldly the future is hopeful.

MOST people would agree that the glasshouse industry is facing difficult times, and some would question whether it has a future. The industry is very vulnerable to influences beyond its control, and it depends on the production either of crops out of season or of crops which cannot be grown without glass in this country. Faster and more modern transport enables fruit, flowers and vegetables to be brought from areas with better climate and lower production costs. Similarly, developments such as quick freezing, drying and canning make it possible to import from distant countries and make produce available over the whole year. Such imports frequently compete with home glasshouse production. There is a scarcity of labour in the industry, largely because of the competition from factories and an unfavourable comparison in rates of pay. Furthermore, the home industry meets direct competition from Continental countries, particularly Holland.

There are about 3,900 acres of glass in England and Wales, of which some 2,300 are cropped with tomatoes, 460 with cucumbers, 200 with carnations and 120 with roses in any one year. The industry is firmly based on the

tomato, and there is a very delicate balance between the areas of the main crops grown. It is impossible to move out of tomatoes into any other crop, except on a small scale, without upsetting the economic balance of the whole industry. The industry stands or falls as a whole, unprofitability in one section tending to be followed by overproduction and then unprofitability in others. Alternative crops have been sought, but so far there is little hope of finding one to take up a sizeable acreage of glass.

If the industry is to have a future—and I certainly believe in it—it must consider whether changes are not only desirable but urgently necessary.

European link-up

The glasshouse grower feels the impact of politics both at home and abroad. The formation of the Common Market and Outer Seven associations could make difficulties for British horticulture, but if competition is on a basis of equality our fears may have little substance. An industry which cannot compete on equal terms deserves to give place to the more efficient. The Dutch are our main competitors at present, though they have no advantage in skill or growing conditions. Their industry is, however, more concentrated in particular areas, and they have a centralized and rigid control of marketing. Recently they have criticized some aspects of the British glasshouse industry. The purpose is not clear, but the attack could be useful if it would only turn the British industry from a defensive to a more positive, offensive position.

At home we are frequently accused of being an industry protected by tariffs. The general effect of tariffs is to keep the market for the home grower when supplies are plentiful and prices relatively low, and to open it to all comers when supplies are scarce and prices high. Manufactured goods are, on the whole, more highly protected by import duties than horticultural produce is by tariffs. The industry should lose no opportunity of keeping the public informed of this.

Main areas of production

The U.K. glasshouse industry is concentrated in five main areas, the Lea Valley, Blackpool, West Sussex, East Yorkshire and the Clyde Valley. The Lea Valley is the largest, with over 1,000 acres of glass, but this area is tending to decline under pressure from the urban expansion of London northward. No effort should be made to maintain it; if the glass is to be replaced, areas with better growing conditions and less competition for labour should be sought, bearing in mind the advantages of keeping the industry concentrated in a few areas to supply large urban centres of population. The best places for winter light and early growing are in the south and south west, but they are a long way from the big markets in the north and the Midlands. It is well worth considering whether any development would not best take place in areas such as the west Midlands, which have reasonably good light and a much shorter haul to the main centres of population.

Training and apprenticeship

The horticultural industry must pay more attention to the entry and training of young workers. We compare most unfavourably with other

industries, whose training and apprenticeship schemes attract the cream of the school leavers. Horticulture is at the stage which other industries passed in the early 1920s, and the response to the Agricultural Apprenticeship Scheme as first constituted was lamentable. I hope that the modifications recently introduced will give the scheme a better future. There are undoubted difficulties in an industry which, though employing some 27,000 workers, is made up of about 16,000 enterprises, 65 per cent of which have less than one-eighth of an acre of glass. This should not be allowed to become an obstacle, but rather a challenge to make the fullest possible use of the training and day release schemes available.

Marketing

The pattern of retail selling is rapidly changing, and while there will continue to be a need for the small retailer an increasing proportion of fresh fruit and vegetables will be sold through chain stores and self-service supermarkets. Such organizations tend to sell under a brand label and require uniformity, high quality and bulk. I think it is pertinent to ask whether sale on commission through urban markets has outlived its usefulness for those products which are sold in greatest bulk. A large number of small independent samples compete one against another for buyers to the disadvantage of the grower, and the system is not suitable for the large buyer wishing to buy on sample. There is a pressing need for more centralized marketing units where the industry is aiming to supply large urban areas, and there is a strong possibility that selling and distribution could be done better from centres in the main production areas.

The industry would be helped greatly by the introduction of uniform standards of quality and grading to enable purchase to be made on sample. We should reduce the production of low grade produce to a minimum, and consider whether under certain conditions the sale of such produce should not be banned. We need to study more closely what the customer wants and then gear the industry to produce it. The sale of most manufactured articles, particularly foodstuffs, is promoted by efficient advertising and market research. It is no longer possible to sell the customer what we think he or she should want. The Flowers Publicity Council has made a commendable start with flowers, but more is needed on a wider front.

Management and technical development

Manufacturing industry makes extensive use of management and work study techniques. The I.C.I. work study unit has shown through the Fernhurst Research Station that such techniques can be applied to the glasshouse industry with benefit and profit. The N.A.A.S. now has a number of officers specially trained in this work, and is keenly aware of the importance of management in advisory work. Nothing but good can come from the use of the N.A.A.S. services and those of the Regional Economics Advisors. Labour is scarce, and we must make it more productive.

If the glasshouse industry is to be maintained and remain competitive it must keep abreast of technical development and apply the results of research promptly. One reason for the pre-eminence of the Dutch glasshouse industry is the importance it attaches to technical development. Two groups of people,

the grower and the scientific worker, are involved. Growers must be more receptive to new ideas and the application of research, but the scientific worker must in turn appreciate and understand the problems of the industry he serves, and take a more active interest in the application of his findings.

It is necessary to understand that modern glasshouse production is a technology as well as an art. The level of cultural techniques must be raised so that the grower can use precision methods, maintaining industrial standards of efficiency and production control. We must be able to produce a given type of fruit, flower or vegetable of high quality to a uniform standard and to order. But work completed and in progress in this country on the design, heating and ventilation of glasshouses, on the effect of environmental conditions on growth, flowering, early fruiting and quality, and the breeding of new varieties having specific characters, leaves one hopeful for the future.

Chrysanthemums in the Smaller Nursery

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There is no room on the market for poor quality produce. Nurserymen must adopt modern methods if they are to grow good chrysanthemums at a reasonable cost.

EVEN though precision growing of chrysanthemums is a commercial practice, the chrysanthemum is still a sound crop for the smaller nursery. The daily acceptance of this flower is good for the industry, but the quantities available at certain seasons enable the buyer to be more selective than in the past. Only good chrysanthemums stand a chance of making good returns.

Modern methods tend to make propagation more and more a specialist job. If a fairly large number of cuttings is required for planting at one time, the smaller grower must consider seriously whether or not it would be better for him to buy plants, or, at least, unrooted cuttings. Perhaps a more profitable crop could be grown in the area required for chrysanthemum stock plants. Modern methods often allow later planting, but this may require a larger number of cuttings. It may not be possible to produce enough material to allow adequate grading; rooting everything to make up the number cannot lead to uniform production and high quality.

Rooting is comparatively simple, and fastidious trimming is time-wasting and unnecessary. If produced under quick-growing conditions the shoots will snap off quite easily, and need trimming only when basal leaves would prevent easy insertion. Quick rooting is achieved in a mixture of equal parts of grit and peat and, if mist-propagation is not available, highly satisfactory results are obtained under polythene covers. Bottom heat from pipes or electrical heating cable speeds up the process, and a further day or two is saved by dipping the cuttings in a rooting compound. Rapid insertion is assured by using a multi-dibber made by fixing rows of pencil-thick dowel rod

into a board the width of the propagating frame; one and a half inches square is a suitable spacing for the cuttings. No firming is required, for a light overhead spray of water settles the rooting medium around the base of the cuttings. If condensation is heavy under polythene, prop open the covers for a short time. In any case, ventilation is required after nine or ten days. Should any signs of *Botrytis* (grey mould disease) appear, remove the infected leaves and dust all plants with five per cent captan.

If early flowering chrysanthemums are being raised to flower outside, the best results from mid-February propagation are obtained by bedding the rooted cuttings into cold frames to encourage continuous growth. Where this is impracticable, it is better to delay propagation until mid March, and then insert twenty-four cuttings in a deep seed tray. When the cuttings have rooted, the boxes are placed in frames. By this means the plants are prevented from becoming hard and starved by planting time. To maintain comparable yields, closer planting is needed with the second method and about fifty per cent more plants are required.

Early flowering under glass

The flowering season on a small nursery need not begin before early summer, and it should finish no later than the end of the year. Production costs are too high for the non-specialist in the early part of the year, and low light intensity makes high quality hard to achieve. Year-round growers sometimes have difficulty in producing blooms that do not scorch in summer, so a large proportion of spray varieties is grown. Here is an opportunity for the smaller man to cater for a reasonably good demand, provided the system fits into his cropping scheme.

Early flowering types are likely to bring in the best returns, and the Sweetheart family, Delightful, Golden Delightful and White Hope Valley are among the earliest. White Hope Valley is particularly prone to damping, and must not be planted where drip or rain from the ventilators can reach the flowers. Cutting starts eight or nine weeks from the planting date when the crop is grown as stopped plants in a cool house, or about five weeks later in a cold house. Single stem plants crop seven to ten days earlier. Gross returns of from thirty to thirty-six shillings per square yard of bed are obtained from such cold house crops sold on the wholesale market.

A bloom density of about fifty-four per square yard is required, and is obtained by planting six inches by four inches for a single stem crop, or nine inches by eight inches for plants that are to be stopped to carry three stems each. Using the varieties mentioned, a cold house planted on 1st April is available for another crop by the middle to the end of August.

Pot growing

The so-called orthodox method of growing in pots so that the crop can be carried into houses in the autumn needs a lot of labour, but the method is still widely used on nurseries where glass is not available in time to allow direct planting. Striking the cuttings in February is unnecessary, however, and leads to a very tall crop that is difficult to handle and expensive to produce.

More manageable plants are grown by propagating mid-season varieties in mid May, and by leaving the lates until mid June. By these means the growing

season is considerably reduced, saving labour and releasing glasshouse space. To maintain the yield, two or three cuttings should be placed in each pot. Hard ramming or potting on benches is neither economic nor necessary. It is much quicker to place the pots on the standing ground and to fill them *in situ*, thus saving much handling and transport. A narrow shovel enables the soil to be thrown cleanly into the pots, and a little firming during planting is all that is required. Each plant needs stopping once, and this is done at the end of June for mid-season varieties and about the third week in July for the later ones.

Many man-hours are required for watering pot-grown plants, but it is essential that they are not allowed to dry out because such checks can be detrimental to the crop. Automatic watering systems are not always available, but time taken in hand watering can often be reduced by careful planning of the standing ground and by provision of sufficient hose. If irrigation lines are available they can be used effectively, at least at the beginning of the season, by putting the pots in blocks.

Direct planting

Direct planting avoids the use of large pots. Young material is planted direct into the soil of the glasshouse. Planting is carried out in summer and the houses are occupied longer. More cuttings are needed than with the orthodox pot method, but the labour requirement is considerably reduced and the quality of the flowers is very high. The time the house is available determines planting distances and the number of stems grown on each plant.

House available for planting	Spacing (*inches*)	Stop	Stems per Plant	Stems per sq. yard
Mid-July	9 × 8	Early August	3	54
Early August	7 × 7	Mid August	2	53
Middle or end of August	5 × 5	Do not stop	1	52

It is possible to reduce the number of plants required by starting the crop early in 3½ inches pots or soil-blocks, or by bedding out into frames to keep the plants growing until the house is available. A growth check from lifting large plants, or from stock being pot-bound, will lower flower quality. This risk, plus the increased labour and space requirement for the additional growing period, and the greater difficulty of planting comparatively bulky material, must be weighed against the cost of additional cuttings.

In frames	Spacing (*inches*)	Stop	House available for planting	Spacing (*inches*)	Stems per Plant	Stems per Sq. yard
End June	3½ inches pots	Towards end July	Early August	9 × 8	3	54
End June	6 × 6	Towards end July	Mid/end August	11 × 11	5	53

These schedules are suitable for November and December flowering varieties. In the Midlands and further south, it is possible to plant 5 inches square on 1st September and produce a single-stem crop for Christmas, provided a night temperature of 50°F is maintained until the buds are visible. After this stage a night temperature of 45°F is permissible. Spray varieties are comparatively easy by this method, and Alvoda, Christmas Greetings, Corsair and Silver-

smith have been grown successfully for the Christmas market. A wider range of bloom varieties is needed, but at present Shoesmith Salmon, Rose Harrison and their sports have succeeded. If the cuttings are being rooted on the nursery it is worth while stringing a row of 60 watt bulbs, six feet apart, above the propagating frame to prevent premature bud formation. Allowing three weeks for rooting, supplementary lighting is required nightly for the last two weeks of August. A time switch is not essential for the lights are turned on at dusk and switched off at 11 p.m.

Liquid feeding and pest control

Aphids and red spider mites can be very troublesome, but a systemic insecticide containing demeton-methyl is effective against both. Some varieties of chrysanthemum are damaged by sprays containing this material, but the drawback is avoided by watering the beds and avoiding the foliage. A piece of piping bent at right angles and inserted into the mouth of the hose enables the liquid to be introduced between the rows. Eight fluid ounces of the concentrated insecticide are required per 100 gallons of water, and this quantity is sufficient for 50 sq. yards of bed. The dilute solution can be siphoned out of a tank, or the grower can use a diluter. Assuming the diluter requires two gallons of concentrate, the grower must mix some material other than water with the demeton-methyl or the diluter will not function. It is very convenient to apply a liquid feed at the same time; a solution of 1½ lb potassium nitrate and 2½ lb urea in two gallons of water supplies nitrogen and potash in the ratio of two to one. If 500 gallons of dilute liquid feed/insecticide are required, fill the diluter with two pints of demeton-methyl and fourteen pints of concentrate liquid feed. The systemic insecticide is effective for about three weeks according to the rate of plant growth, but reliance for pest control must never be placed on one substance and it is wiser to use another material before resorting to demeton-methyl again.

Weed control

Weeds can be a problem on a nursery of any size. Herbicides such as those containing cresylic acids have been safely used for some years, but it is now possible to make tentative recommendations for other materials that have been used on outdoor crops. Cresylic type sterilizers containing 40 per cent tar acids are used at the rate of 2½ gallons to 100 gallons of water, but they must not be sprayed on to the weeds until the base of the chrysanthemum stem has hardened and become woody. The spray is directed on to the weeds, avoiding the chrysanthemum leaves as much as possible, but if some of the lower ones are damaged it is not a serious matter.

2,4-DES has been used successfully on land free from weeds. The spray is applied all over the area, chrysanthemums included, but 10 to 14 days must elapse between planting and spraying. The material is used at the rate of 5 lb active ingredient per acre. Two varieties, New Princess and Pauline Shepherd, have been damaged by this treatment.

Simazin and monuron at 2 lb active ingredient per acre have been used on standing ground some ten days before the pots were brought out, but on some occasions damage has occurred.

Laxton's Superb Pear and Fire Blight

F. A. ROACH, B.Sc.
N.A.A.S., South-eastern Region

Fire blight might never have become a serious disease of pears in England if the highly susceptible Laxton's Superb had been absent from our orchards. Should we give up this variety?

THE pear Laxton's Superb was bred in 1901 by Messrs. Laxton of Bedford and introduced to commerce in 1913. Being one of the first pears of quality to ripen in August, it was planted to a considerable extent and was used as a pollinator for Conference and also for Doyenne du Comice.

In the 1951 Fruit Tree Census, of the 16,287 acres of pears in England 8 per cent, or 1,280 acres, were Laxton's Superb, 714 acres being under and 566 over 7 years of age. The greater part of these, as of the total pear acreage, was in Kent, where 586 acres were grown. Other counties with fair plantings of this variety were Essex 99 acres, Worcester 86 acres and Norfolk 84 acres. No separate figures for the Laxton's Superb acreage were taken in the 1957 census.

Though it is a comparatively heavy cropper, in practice Laxton's Superb has been found to suffer from certain disadvantages. The fruit when ripened correctly is of good flavour but very quickly passes out of good condition and becomes mealy. To enable it to be marketed in reasonable condition growers have usually picked the fruit while still quite firm and green, at a stage when it has to be practically cut from the trees. In spite of this precaution, many consignments of Laxton's Superb start to break down during their distribution through the wholesale markets, and reach the retailers in poor condition or become unsaleable within a very short time. For this reason the variety has become unpopular with many sections of the distributive trades and, although used to a limited extent for canning, market prices obtained for the fruit in competition with imported Williams' Bon Chrétien have often been poor.

Another disadvantage of the variety has been its marked susceptibility to attacks by pear scab, *Venturia pirina*. When grown alongside Conference, Laxton's Superb often shows signs of scab while the Conference remains free. This resistance of Conference to scab has meant that in some orchards in the past no spraying against the disease has been necessary. The presence of the scab-susceptible Laxton's Superb in an orchard may encourage the development of the disease and increase the risk of attacks developing on adjoining Conference.

These factors have already led to Laxton's Superb losing its popularity with many growers, and comparatively few new plantings have included this variety in recent years.

Infection through secondary blossom

Pear trees attacked by the bacterial disease fire blight were first seen in this country in Kent in the late summer of 1957, although the cause of the trouble, the bacterium *Erwinia amylovora*, was not identified until the spring of 1958.

In each of the five orchards originally attacked, trees of Laxton's Superb pear were found to be dying from extensive cankers in the stems and branches. In all these original outbreaks and in all subsequent ones, the attacks were confined practically entirely to Laxton's Superb and only occasionally were adjoining trees of other varieties infected, an exception being a severe attack on the variety Fondante de Thirriot found in 1958. In one of the original outbreaks first seen in Kent in 1957, 80 per cent of the Laxton's Superb trees were killed or badly damaged while other varieties were practically unharmed. The same has been true of all outbreaks found since in commercial orchards, both in Kent and more recently in the Wisbech area. In the first ten months of 1960, it was estimated that in Kent outbreaks 97 per cent of the trees attacked were Laxton's Superb, with very minor attacks on Bristol Cross, Conference, Doyenne du Comice, Dr. Jules Guyot and Williams' Bon Chrétien.

The usual way in which a pear tree becomes infected is through the blossom, to which the bacterium may be carried by bees. From the infected blossom the disease can spread rapidly through the flower stalks into the spurs and branches, and can eventually kill the whole tree. At East Malling Research Station, it has been shown under controlled conditions in the glasshouse that the disease can make much more rapid progress in Laxton's Superb than in Conference or Williams' Bon Chrétien trees.

Quite apart from this more rapid spread of the disease within the tree of Laxton's Superb, one feature of all the outbreaks has been that nearly all the trees have been infected through secondary blossoms. It is common experience that Laxton's Superb is very prone to develop such secondary blossoms on the current season's growth, these blossoms opening in midsummer or later. The amount of secondary bloom varies from season to season, and it is of interest to note that in 1957, the year the first outbreak of fire blight was seen, secondary blossoming in Laxton's Superb was very marked; in fact some growers were even able to pick a light crop resulting from these secondary blossoms in early October of that year.

The reason for the susceptibility of the secondary blossoms to infection is that epidemics of fire blight are only severe when the maximum daily temperatures during the blossom period exceed 65°F, coupled with some periods of high humidity. Under these conditions widespread blossom infection and spread of the disease to the branches occurs. In Great Britain, in contrast to regions of the U.S.A. where fire blight has practically eliminated the growing of pears, daily maximum temperatures during the main blossoming period in March and April are usually too low to allow of infection, though suitable conditions often occur during June and July. Secondary blossoms of Laxton's Superb are often out during the first and second week in July.

It is of course possible that in exceptional years, for example when blossoming in spring has been very much delayed by prolonged cold weather, followed by hot weather during the blossom period, temperatures might be high enough to allow infection of primary blossoms, but such conditions only very rarely occur.

Avoidance of the disease

One way in which infection of Laxton's Superb pear trees through the secondary blossoms can be prevented is by the removal of such blossom.

This step has already been taken by a number of growers, both by owners of orchards in which infection has occurred and as a precaution by others. The orchards must be inspected regularly owing to the spread of the secondary blossom period over several weeks, and this method cannot be regarded as one which will give complete immunity from attack.

The plant pathologists and others most closely concerned with the outbreaks in England consider that if Laxton's Superb had not been present in orchards fire blight would not have appeared, or would have been negligible in commercial orchards in this country. It is true that the disease has been found in a number of genera of ornamental plants in gardens and nurseries in south-east England, and also occasionally in hawthorn hedges, but if the possibility of infection of Laxton's Superb were removed the disease might not make any easy progress in pear orchards. The longer a susceptible variety such as Laxton's Superb is grown in an orchard the greater the chances of the disease becoming established in surrounding hawthorn hedges and other pears, and even attacking apples.

Under the Fire Blight Disease Order 1958, all infected trees have to be removed and burnt, but already several owners of commercial pear orchards in which fire blight has been found have eliminated all Laxton's Superb trees from their orchards as a precaution against further outbreaks. The Fire Blight Disease Order also contains powers to control the sale of the fruit, and if a tree nursery becomes infected to control or prohibit the sales of trees or bushes. As a precaution, therefore, several nurserymen have already given up the propagation of Laxton's Superb pears and removed the variety from their lists.

It does seem that the time has come when all commercial growers, nurserymen and others should seriously consider omitting Laxton's Superb from further plantings and eliminating it from their orchards and nurseries.

Suggested steps to be taken

In existing orchards the only satisfactory course to be taken if risk of infection by fire blight is to be minimized is to grub all Laxton's Superb trees entirely. Such a step is the obvious one to take with old or mixed orchards, where replanting on the same or another site might be a capital improvement of advantage to the owner. If existing orchards are entirely grubbed the work may be eligible for a grant of one-third of the cost under the Horticulture Improvement Scheme. Such grants are not, however, given for partial grubbing, as where trees of Laxton's Superb serving as pollinators alone are removed.

Where the orchard has been planted only a few years it may be well worth while to remove any Laxton's Superb trees and replace them with new trees of another variety. Unfortunately, Laxton's Superb is present in many fairly young orchards which have only recently reached their cropping stage. To grub such orchards completely may be a heavy financial loss to the grower and it may be better to consider grafting Laxton's Superb trees with another variety.

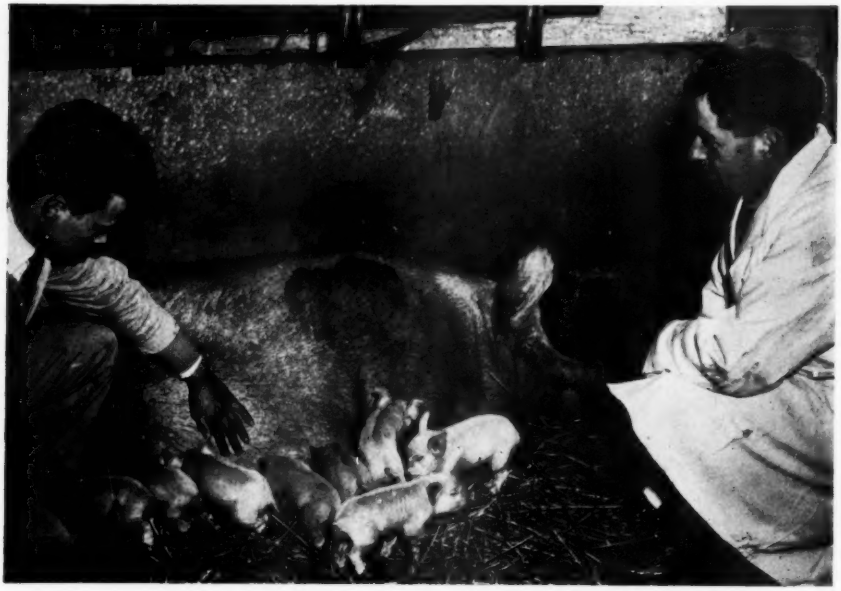
If grafting is undertaken it is probably best to "top work" these trees, cutting the main framework branches hard back and inserting scions of the new variety into them, using rind grafts. In this way practically the whole

Photo: *East Malling Research Station*

(*Left*) An advanced stage of the disease. The infection has spread from a blossom on a lateral twig, the leaves of which are turning brown.
(*Right*) The earliest stage, showing recently infected summer blossoms; note the blackened flower trusses.

Agriculture at a Grammar School (Article on pp. 578-80)

A group of sixth form biologists. Science teaching is closely allied to the agricultural course.



A pupil and the school farm bailiff inspect a new litter. The school's pigs reach an average weaning weight of 40 lb at eight weeks.

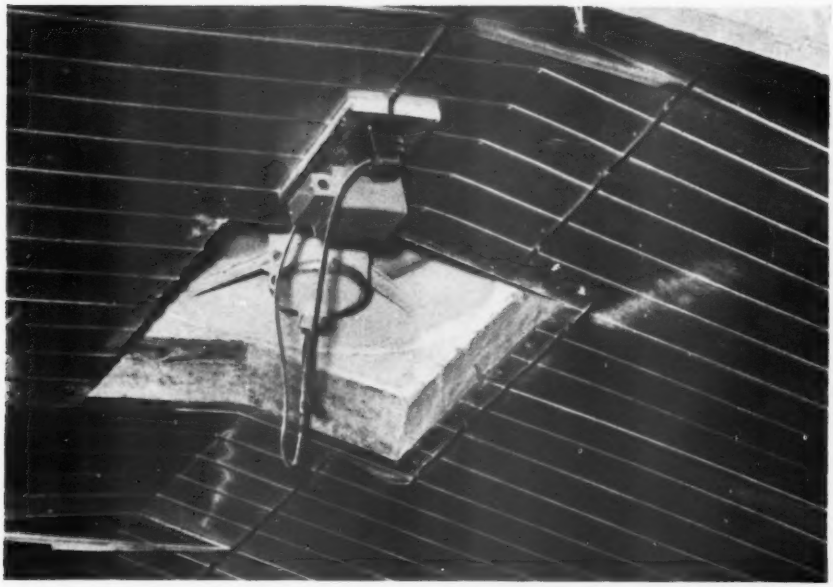


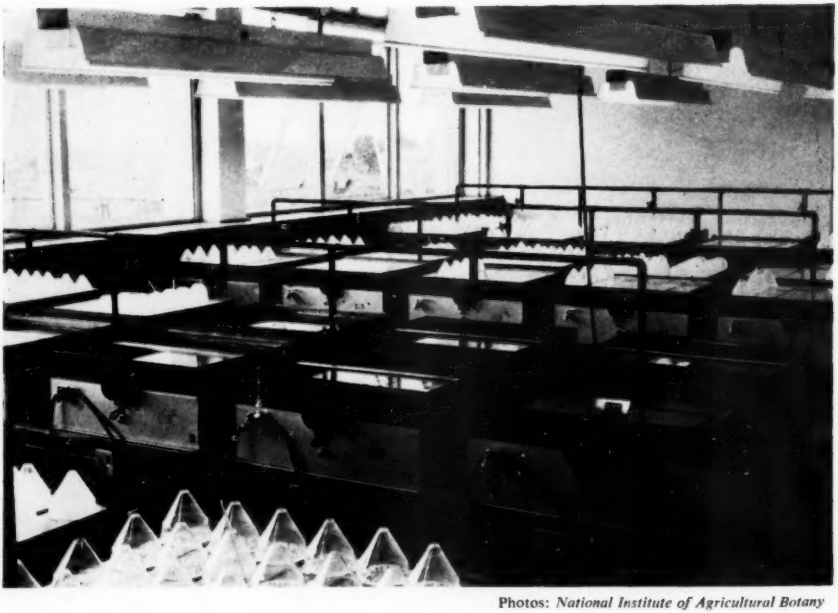
Photo: *Houlton Bros.*

Double skinned aluminium combined with a 1-inch fibreglass lining gives good thermal insulation to the roof of this laying house.

Photo: *Trevor Davies*

A typical windowless layers house with controlled environment. The wall inlets are of restricted depth, and good design is needed to prevent light leaking in.

Better Seeds: Better Crops (Article on pp. 553-6)



Research at the National Institute of Agricultural Botany. (*Above*) Spring barley trials. (*Below*) Germination tests on grasses.

Photos: *National Institute of Agricultural Botany*

framework of the tree will ultimately be composed of wood of the new variety resistant to fire blight attack. Of course care must be taken to remove any new growths of the Laxton's Superb arising from the basal part of the tree, and especially to remove any blossoms on the old trunks.

The alternative method of "frameworking" the Laxton's Superb trees carries with it a greater risk of possible infection with fire blight. In this method the main framework branches of the tree are retained practically full length, the scions being inserted on stubs of cut back laterals or direct into the main branches. Obviously if this method is used very great care has to be taken, including constant rubbing out of shoots arising from the old framework, to ensure that all growth of the Laxton's Superb is suppressed.

In the case of young trees in the nursery, it may be possible to graft scions of the new variety leaving very little of the old stem of Laxton's Superb.

Alternative varieties

If Laxton's Superb is to be eliminated from existing orchards or from new plantings where it was intended to serve as a pollinator, the problem of its replacement by other suitable varieties arises. Laxton's Superb flowers relatively late, hence its value as a pollinator for Doyenne du Comice, but it has often been planted with the mid-season flowering Conference, their flowering periods usually overlapping sufficiently to allow of cross-pollination.

Unfortunately the number of pears of commercial value is very limited. For pollinating the Conference pear, Williams' Bon Chretien and Packham's Triumph in flower mid-season, Beurre Hardy mid-season to late, and even the late flowering Doyenne du Comice might be considered. Incidentally, successful grafting over of Laxton's Superb to Packham's Trijmph has been done by several growers.

Bristol Cross, Glou Morceau and the American variety Gorham are late flowering but cannot be generally recommended. Bristol Cross produces little good pollen, and Glou Morceau is of limited commercial use owing to its extended ripening period, though it could be of value for gardens. Gorham has not established itself as of commercial importance. Merton Pride blossoms in mid-season but, being a triploid, would be a poor pollinator.

★ NEXT MONTH ★

SHOULD WE PLAN *by Ivor Wyn Jones*

ATTITUDES TO FARM LABOUR ECONOMY *by G. H. Brayshaw*

STARLING ROOSTS AND THEIR DISPERSAL *by Brenda M. Bickerton and W. Chapple*

LAMBS WHEN DESIRED *by Allan Fraser*

Agriculture at a Grammar School

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and
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The school farm at Brewood is used not only to teach agriculture with conspicuous success, but also to help in teaching science and other subjects.

BREWOOD Grammar School has taught agriculture for over 60 years. This early start reflects the enterprise of the headmaster, the local education authority and the governors, who noted the possibility of exploiting the facilities for farming at this school and the rural background of most of the boys then attending. In 1960 only a small percentage of our 120 dayboys and 80 boarders had a farming background; many came from the suburbs of Wolverhampton. But we still have boys who are attracted especially to Brewood by its agricultural course because of its obvious connection with their future livelihood, and who bring with them an enthusiasm for and a thorough knowledge of rural and agricultural matters.

Integral with the school are a twenty acre farm, with an acre of woodland and one of vegetable garden. The farm has up-to-date buildings and is well equipped with machinery. A common type of rotation is demonstrated—three years ley followed by three years arable production. The yields of the arable crops are well above the national average, for every effort is made to attain as high a standard of husbandry as possible. This is also demonstrated by the small Ayrshire herd of six with an average of over a thousand gallons; by the hens, with 70 per cent production on deep litter during the past winter, and by litters from pedigree Large Whites averaging eleven 8-week-old pigs with weaning weights of forty pounds.

The farm is organized by the agricultural master. This has the effect of closely linking classroom teaching with practical operations and other events on the farm. The presence of a farm bailiff makes it possible to arrange that the boys spend their time in a valuable variety of practical work, and it avoids spending teaching periods on operations of slight educational value. Practical work is done before and after school and also at week-ends, so that teaching time is devoted to formal lessons, farm walks and laboratory study of specimens collected from the farm.

With these particular facilities the school can fulfil four aims. It can provide, as part of a general education, a study of agriculture for all boys during their first two years at the school. It can give all the boys, but especially the boarders, useful and constructive physical activity on the farm to supplement games. It can effectively teach agricultural science for examination purposes to those boys who choose this particular subject. Finally it can enrich the teaching of other school subjects, particularly science, for all boys.

Five-year agricultural course

Boys who are interested in the five year agricultural course pursue studies leading the G.C.E. "O" level in agricultural biology. The syllabus for this

examination comprehensively covers the field of fundamental and scientific agriculture. In following this syllabus constant reference is made to activities on the school farm, which provide invaluable aids to the teaching of this subject. Every effort is made to use the farm for demonstration purposes. For example, this year a technique developed at a Ministry experimental husbandry farm has been followed to produce seed potatoes for our early crop. This is valuable since it serves to illustrate that virus diseases can be transferred by aphids, and therefore can be controlled to a certain extent by systemic insecticides. It also helps to demonstrate visually virus disease symptoms as found in potatoes. Practical experience gives the boys a great interest in subsequent classroom discussions.

At the present time a series of demonstration plots in part of the garden not used for routine horticulture is being established. The plots illustrate soil nutrient/plant relationships, plant propagation and plant breeding. This year specimens of common grasses and a wide range of arable crops will be sown.

Although emphasis is on teaching the sciences basic to a fundamental understanding of the natural processes found in agriculture, the practical aspects are not neglected. Every boy who belongs to the farm club undertakes weekly practical work on the farm. During the year each boy is given instruction in and undertakes all the routine duties in connection with the classes of livestock, and is taught general farm and garden duties. A large number of demonstrations are given, including castration of pigs, culling of poultry, hedging and pruning.

The farm club also engages in a number of activities outside normal school hours, and during the winter a programme of lectures, films and discussions is arranged. In the summer term visits are made to research stations and farms. The junior club makes models of buildings and equipment, and draws production graphs using data from the farm.

The farm in the classroom

In a grammar school the farm will have an influence on the usual academic subjects which are our major concern, and in particular on the sixth form, which we tend to regard as specially important. W. H. Knowles in his article *Education through Farming** showed how, in secondary modern schools, an extensive range of teaching can be based on agricultural work. He quoted both practical and academic instances, and the latter serve similarly to help the teaching at Brewood. Examples from the farm are used in mathematics. The type of agriculture is related to the geography of the area. This widening of teaching in other school subjects was the fourth aim envisaged, but it would be wrong to suggest that all the teaching is so based and that the farm has universal application to all the work in the school. The widest application and the greatest stimulation obviously come in biological science.

Here the applications are threefold. First, quite naturally, some topics included in the syllabus for biology examinations are primarily agricultural. A study of plants would be incomplete if the cultural routine for some crop was not studied. At Brewood the potato is chosen. This is a crop with which most boys have had some practical work. The study stresses the nutritional

Agriculture*, 1957, **64, 80-82.

requirements of plants; it introduces the effect of soil conditions on plant growth, and other biological circumstances. Similarly during their study of animals the boys apply their knowledge of the diet of a laboratory mammal to the feeding of livestock, and discover that cows have the same basic requirements which must be related to yield. Other examples at "O" level are numerous. Aphids, soil, rotation of crops, rust fungus are all studied in biology, while in chemistry an example is the effect of lime on freshly manured soil. These agricultural topics are dealt with at "A" level in greater detail, together with other topics such as parasitic worms of plants and animals.

The second influence of the farm on biology teaching is in providing daily examples for the general statements made. The cow is often the first mammal that comes to mind; when protection from disease is discussed, swine fever vaccination and T.B. testing of cattle are quoted; not only is consideration given to the virus diseases of mumps and measles in man but also to mosaic in crops.

Experimental work

The third of these applications is felt to be of particular importance. In the large science sixth form of forty, the biologists may carry out in their free time a project involving them in a personal and lengthy experimental study. This may even be submitted for examination purposes. It is important that this makes them assume responsibility for a programme of work, involves them in an exercise in self discipline, and makes them plan the work and apply their minds to logical reasoning about abstract matters. It was during work like this that one boy, having surveyed the earthworm and plant population of some land, investigated in the laboratory their relationship with the oxygen content of their atmosphere. Another boy is working on couch grass control by cultivation and linking it with laboratory experiments.

Similar but less stringent experimental work is done with lower forms in the school. This is often done after school or in the boarders' hobbies period, when each boy may take a share of the work on a rota, and more time can be given to such experiments.

Some farmers' sons who could benefit from the sixth form course leave in the fifth year. But each year, boys leave the sixth form to enter agricultural courses at university or college, or to take up work with an agricultural background. They are often town boys, and this trend is encouraging at a time when the migration is often from agricultural to urban pursuits. It would seem too much of a coincidence if this were not a result of the farming background at Brewood, stimulating an interest in the science of agriculture. Perhaps some of Brewood's past pupils, who have included the Director of Agriculture in Malaya, a vice-president of the N.F.U. and a holder of the Queen's Prize in Agriculture, justify the belief that the school is not only unusual but also of value.

Not all schools can have a farm, but the wider interest in rural studies and the wider use of farm adoption could provide at least some of the benefits derived at Brewood from the link with agriculture.

1961 Oxford Farming Conference

2nd—4th January

W. E. RICHARDS, B.Sc., N.D.A.

National Agricultural Advisory Service, Oxfordshire

This was one of the best Conferences for years. Wide ranging, knowledgeable and fair, both audience and speakers excelled themselves.

TWENTY-FIVE years ago the first "Conference on Mechanization in Mixed Farming" was held at Rhodes House, Oxford. Four of those who read papers in January, 1936 were among the large audience at this year's 15th Oxford Farming Conference at Oxford Town Hall. The war years and their aftermath forced on apace the development in mechanization that was stirring in the '30s. They also closed down the Conference until 1951. Since then, with MR. M. H. R. SOPER of Oxford University as secretary-treasurer, it has grown from strength to strength. Its committee, comprising farmers from all parts of the kingdom, have always been abreast of the times. Particularly was this shown in this year's theme of "Food and Farming in a Changing World".

MR. R. MAUDLING, President of the Board of Trade, spoke at the Conference Dinner of the need for some agreement between the European "Six" and the "Seven", and on problems presented by different ways of supporting agriculture. MR. H. WOOLLEY, president of the National Farmers' Union, spoke of the challenge facing home farmers and the need to ensure that the agricultural industry was not thrown to the wolves. These challenges and problems were developed in detail by the first day's papers.

Foreign problems

MR. T. BERESFORD (Wilts) struck a keynote in his entertaining but pungent paper on "World Pressures on U.K. Agriculture". Asserting that our farmers had been living in the shelter of a walled garden, he called for self-discipline to meet the competition of foreign producers organized to export their surpluses.

The relationship between "Australasia and the British Market" was the subject of the second paper, read by MR. C. R. KELLY, M.P., of Adelaide. He spoke of Australia's need to export, with an acute balance of payments problem aggravated by rapid industrial development and immigration. Her exports were mainly from primary industries, principally wool. Could she sell more wool, if she produced it? Mr. Kelly hoped that present movements for economic integration would allow the freer flow of world trade in primary products.

DR. HANS KROHN of the European Economic Community, Brussels, read a long and detailed paper on "The Agricultural Problems of the Common Market". He was frank about the many historical and psychological problems to be faced by the "Six" nations. Their goals were increased agricultural productivity and an improved standard for the rural community from North

Sea coasts to Sicily. He was questioned about price levels and the prospects of E.E.C. exports on world markets in 1966. Dr. Krohn forecast levels closer to Dutch than to German prices, an answer that clearly impressed his audience.

Forebodings were sharpened by MR. O. G. WILLIAMS (N.A.A.S., Wales), a former attaché at Washington, in his paper on "Trends in North American Production". He gave striking figures to illustrate the recent drop in the number of U.S. farms and their increase in size. The farm population had decreased by over 30 per cent in twenty years, but the output per man-hour of farm labour in 1959 was nearly three times that of 1940. North American farm production in 1960 reached a new high level, 29 per cent above 1947-49. Troublesome surpluses of the major crops had been accumulating for several years. Mr. Williams forecast increasing efforts to sell American surplus grain, pig and poultry meat and dairy produce abroad.

Home market

After these reports from four continents, the Conference turned to the home market. An authoritative paper on "The Future Requirements of the British Consumer" was given by MR. A. D. BONHAM CARTER, a director of Unilever Ltd. of London. He said that we had a country with an increasing number of well-to-do, well-fed town-dwellers. The housewife was concerned more with service and quality, and these would dominate the food industries. There was growing demand for pre-packed and preserved, prepared and ready-cooked foods. It did not pay to freeze anything but the best, nor should preserved foods compete with fresh foods in season. Farms now produced foods as the raw materials for factory processes. In discussion, the Conference voiced some misgivings about the relationship between the contracting farmers and the processor.

After the first day's papers the Conference moved to the Randolph Hotel. Following a short and satisfactory business meeting, there was an interesting demonstration of pre-packed foods by J. Sainsbury Ltd. Messrs. F. W. SALISBURY and W. M. JUSTICE represented these well-known retailers in a discussion on "Presentation and Selling to the Public". They urged that both the farmer and the distributor exist primarily to serve the consumer. Cleanliness, freshness and honesty in presentation are essential in the interests of all three parties. The audience were interested to hear that sales of Sainsbury's turkeys were extremely discouraging, except around bank holidays, and impressed by the high costs of building and equipping a self-service store.

Co-operation and integration

"What shall we do to be saved?" asked MR. E. M. OWENS (Somerset) in leading the discussion after the first four papers. Some answers were given by the five farmer-speakers in the Conference's second day, back at the Town Hall, which dealt with "Quality Production for Tomorrow's Market".

In a thoughtful paper, MR. JOHN HOPE (Glos.) covered "Pigmeat and Eggs". New channels for marketing farm produce would increase the demand for continuous supply, standardized quality and production at a competitive price. British farmers must wake up before it is too late. In pigmeat production there had been no great changes in the last twenty-five years, but

the poultry industry had taken giant strides in the last decade. This clearly pointed to the need for co-operation and integration among producers. Mr. Hope suggested the formation of pig groups, with farmer-members of two types—one producing weaners from "pig-hatcheries", the other growing pigs on to slaughter.

MR. G. CARTER (Wilts) dealt vigorously with "Poultrymeat from the Mixed Farm". He was confident that the general farmer had no place in this very modern industry unless prepared to accept some linkage or integration. It called for fresh thinking, a readiness to accept new economic and production principles. Capital needs for broiler chicken could be very high, but so could the returns on capital invested. Capons were relatively insignificant, but turkeys were attracting the general farmer at an alarming rate. Mr. Carter described two methods of keeping these birds—the "teenage" turkey and the large turkey. At present it was the latter that could be relied upon by the general farmer.

"The Future Marketing of Vegetables from the Farm" by MR. D. A. BOWERMAN reinforced the warnings of earlier speakers. Chairman of the Horticultural Marketing Council and a former wholesaler, he traced the distribution chain back from housewife to grower. With a rising standard of living there appeared a swing towards quality and value for money, rather than price. With many married women going out to work, they demanded the minimum of work in the kitchen. This meant a continuous supply of regular graded and quality packaged produce to wholesaler and retailer. The larger distributor would not be interested in erratic and small quantities. The small grower's future seemed to lie in some form of co-operation. Mr. Bowerman urged a greater stability in acreage. Uncertainties of the season were accentuated by wide fluctuations in crop acreages. The modern grower should consult with salesmen before deciding on his cropping and should keep them informed of harvesting. It was really necessary to have closer collaboration and confidence between grower and marketing organization.

Sheep and beef

In the last afternoon, still at the Town Hall, the Conference heard two papers on sheep and beef, a swing of attention away from ultra-modern factory lines of production. MR. F. RUSSELL WOOD (Dorset) described himself as an intensive "dog and stock" man and dealt with "Lamb Production in a Competitive Market". To compete with the New Zealand lamb, we must think only of young, milk-fed lambs straight off the ewe. This was practically the only natural food. No other sheep should be entitled to usurp the name of lamb.

There are obvious imperfections in marketing, and to improve this Dorset farmers had formed the Dorset Quality Lamb Producers' Association. The objects are to promote co-operation and confidence between producers and slaughterhouses, and so improve the quality of English lamb reaching the housewife.

MR. W. H. M. DAWSON (East Lothian) gave the tenth and last paper, on "Intensive Beef Production". Rearing and fattening Friesians, he felt, was the most profitable way of utilizing feed acres on his arable farm. The broiler beef technique was still a job for the specialist. He described his own

methods and gave detailed costings. Friesian beef could not compare with prime Scotch beef, but its lean meat should attract the average customer in the self-service store. Who is to say what is quality meat—the customer or the beef producer?

In the discussion following these papers, it was stated that up to 20 per cent of useful British Friesian bull calves die before eight weeks old from chills and scours. This would be reduced if the calves could be carried on for a few weeks on their home farms. There seemed to be a need for some arrangement to supply strong calves on contract to rearers. In further wide discussion, there was a plea for valid costings with beef. Of all products, beef was in greatest demand and had the strongest position in this country, Europe and North America.

The Conference concluded with an informal discussion in Worcester College Hall. Here its chairman, MR. J. ROWSELL (Hants), led a lively forum into the question of the Common Market and the U.K. Many well-known farmers seemed agreed that this country could not afford to stay out of E.E.C., and that the longer this was deferred the greater the resulting problems. On the other side it was urged that the U.S.A. is a great common market but within it are large areas of depression, both industrial and agricultural. A common advertising policy for farm products was canvassed. This would prevent wasteful competition between commodities, but how was the money to be collected? Should not the wholesaler and retailer also contribute to such advertising costs?

Well-earned tribute to chairman and committee

In a graceful tribute to chairman and committee, Mr. C. R. Kelly of Australia said he had been impressed by the evident high level of both technical and organizational ability displayed throughout the Conference. He could not understand the apparent uneasiness of British farmers about the future. He felt that the audience were capable of standing up, as before, to all that tomorrow might bring.

Thus ended an outstanding Conference, by common consent the most successful of recent years. It will be remembered for the scope of its papers, the calibre of its speakers and the informed level of discussion—and not least for the apparent capacity of the audience to rise to the challenge of the times. The absence of sectional interest was remarkable. The Conference fully appreciated the objects of the committee—to give some information on the problems looming ahead, and to trace out some answers.

Among the highlights that stand out in retrospect are the witty, biting strictures of Mr. Beresford, the vigorous and astringent remarks of Mr. Kelley, the ambitious E.E.C. aims detailed by Dr. Krohn, and the ability and confidence of farmer-speakers on the second day. The Oxford Conference holds its special place as much by its friendly informal discussions as by its formal papers. This year was no exception to the rule of unobtrusive, efficient administration. The influence of the Conference is such that it might be a pity to have to limit the attendance. Some people, however, would like to see a return to the more intimate surroundings of the Oxford Playhouse with its better accoustics. This is perhaps the only possible improvement that could be made on the 1961 Oxford Farming Conference.

Autumn Rains of 1960

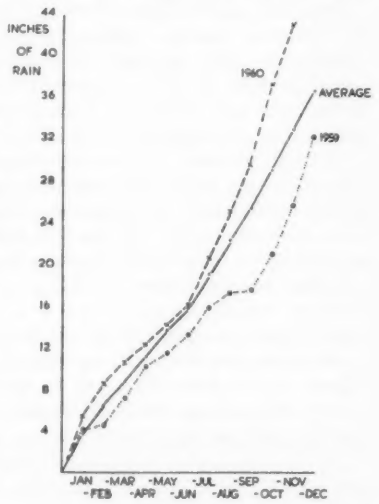
LIONEL P. SMITH, B.A.
Meteorological Office, Air Ministry

None so surely pays his debt
As wet to dry and dry to wet.
Old country saying

THE rainfall of Britain is notoriously variable and we all know that meteorological records, like all others, are made only to be broken, but it is most unusual for two major rainfall records to be shattered in successive years.

The network of rainfall recording stations is such that a close estimate can be made for the general rainfall over the whole of England and Wales, and monthly figures are available for all years from 1727. By the autumn of 1959 it was clear that the all-time middle-distance record over five consecutive months had been broken. The national rainfall for the May to September period was only 7·37 inches, as compared with the long-term average of 14·30 inches, that is, 51·5 per cent. This was the "lowest ever" for the 232 years when comparable figures were available.

The year of 1960 started with two wet months, and then followed a dry period of four months, such that by the end of June the general rainfall was almost precisely equal to the average. Then came the deluge. From July to November the rain was practically unceasing, and October in particular was a very wet month, with nearly 7½ inches over the country as a whole. This is equivalent to about 28 thousand million tons of water. As a result these five months produced a total of 26·85 inches, which is 157·5 per cent of the average. Again this is an all-time record since 1727, the nearest approach to it being the 26·3 inches recorded in 1852. Incidentally there have been two wetter Octobers, 1865 with 7·6 inches and 1903 with 8·3 inches claiming priority.



In December the weather became slightly drier, and there seemed little chance of the annual record being broken. In fact 1960 just climbed into third place in the "wettest year" championship. the leading positions being as follows:

	inches
1872	50·7
1852	49·8
1960	47·1
1768	46·9
1903	45·1

It also claims the dubious distinction of being the wettest year for the present century.

The figures for 1959 and 1960, together with the average, are illustrated in the graph, which shows the cumulative rainfall totals for England and Wales. The extreme dryness of 1959 which was evident at the end of the long summer was modified by the rains of November and December. In the following year the tendency to heavy rain late in the year was even more pronounced, as is shown by the steepness of the graph at this point.

Flooding and its consequences

The first, obvious and catastrophic consequence of such abnormal rain is flooding. There are four main causes of serious flooding in Britain: snowmelt, sudden severe storms over a limited area as at Lynton and Lynmouth, inroads of the sea as in 1953 on the East Coast, and, as in the present case, persistent rains over a long period.

By the end of August most soils in the country were back to field capacity. In autumn the rate of loss of water by evaporation and transpiration is decreasing rapidly, dropping by 50 per cent in each successive month. There remain only two ways of disposing of excess water on the land; by percolation downwards through the soil, which is a slow process at best and becomes even slower when the surface is constantly battered down by raindrops or sealed like a pond by standing water; the other is by subsoil and surface drainage out to sea.

The better the drainage, the bigger is the strain placed upon the ability of a river to carry large quantities of water to sea in a relatively short interval of time. If, in addition, strong winds are building up high tides at the river mouth and preventing rapid egress of water, then river levels are bound to rise. Sooner or later, the river overflows the banks, and floods result. If the natural flood-plain of the river has been built on, damage to property must occur, and the fact that this is the wettest autumn for a couple of centuries is poor consolation for either farmers or householders.

The effect on farming, however, goes further than this. The rains have prevented the lifting of many crops such as potatoes and sugar beet. Autumn cultivations have become well-nigh impossible and the programmes of autumn sowing have been brought to a standstill. Furthermore, the texture of the soils has suffered and the leaching of lime and nutrients must have been far more extensive than usual.

It is the damage to soil structure which is most important and most difficult to put right. The best weather in these circumstances would be a period of hard frost without snow. This would penetrate the top foot of soil if the cold spell were long enough, and the freezing of the water in the soil would help to reintroduce a good crumb structure.

It has been a feature of British weather that cold winters have often followed wet autumns, and this year may be no exception. If the winter is cold I hope this has already occurred by the time this article is published. A hard January would be an advantage, but a cold spell in February and March would delay all work in spring and not only the arable farmers would suffer, for grass would be late to start into growth and summer milk yields would be depressed.

Our Poultry Industry

ANNIE IRONSIDE, M.B.E., N.D.D.
National Agricultural Advisory Service, South-eastern Region

A general account of the great expansion and development of our poultry industry from 1900 to the present day.

EARLY historical records show that poultry were selectively bred for eggs, meat and fighting qualities. The Greeks and the Romans appreciated their usefulness and profitability, and poultry formed an important section of the retired warriors' livestock. It is interesting and humbling to note that even in those early times advice was given on much the same lines as today on breeding, feeding, rearing, housing, disease control, costs and marketing.

At the beginning of this century, records show that egg production was around 70-90 eggs per bird a year. Selective breeding by trap nesting and handling was started, and by 1939 the average for laying trials birds had been lifted to 170, with many individual records of well over 200 eggs. Many breed and poultry societies were active in improving our poultry flocks.

The Ministry introduced the Egg and Chick Scheme in the second decade of the century, and later on in the 1920s the Accredited Poultry Breeding Scheme took its place. This was later replaced by the Poultry Stock Improvement Plan, which still operates. The scheme is voluntary, and breeders make annual application for membership.

Laying trials also played their part in improving poultry stock. In the 1930s many county egg laying trials were started, so that local breeders could enter their stock for official recording. National laying trials had earlier been established by the poultry industry. The latest development in this field is the Ministry's Poultry Progeny Testing Stations, which were started in 1957. To qualify for breeders' grade, breeders must submit a random sample of hatching eggs annually. Scoring includes hatching, rearing, egg production and mortality, and breeders' grade stock must score the necessary points on the basis of a running average of three entries.

The first period of real expansion took place after the 1914-18 war, when returning servicemen, wishing to pursue an open air life, found that poultry farming was relatively easy to start on limited capital, and returns came in quickly. Many specialist farms were established for commercial egg production. After experience in this field some farmers became poultry breeders. Disease problems increased, and flock mortality was very high in the early 1930s. During this period of expansion farmers started keeping poultry more or less intensively. The more sheltered conditions favoured higher egg production, and it was not long before the poultry keeper found that prolonging the length of day by artificial lighting in the dark winter months led to better egg production. On general farms, poultry flocks were not normally expanded to the same extent, though many farmers' wives found a poultry flock most useful, particularly in the years of agricultural depression.

At the outbreak of the second world war, poultry stocks had to be drastically reduced, and poultry keepers were allowed rations for varying levels,

averaging one-fifth of the number of birds shown on their June returns for 1939. Table poultry production came to a full stop, as very little food was allowed and prices were controlled at an uneconomic level. The Ministry took steps to see that a sizeable proportion of sound breeding stock was retained, and special rations were issued for these flocks. Food was also granted for the rearing of replacement stock and pullets for domestic poultry keepers. When food rationing ended in 1953, rapid expansion took place on the majority of farms. The foundation stock used for this expansion was healthy and vigorous as a result of the severe rationing and consequent culling of poor quality stock.

Post-war boom

In 1946 a delegation of officials and farmers visited the United States to study the poultry industry. Information obtained was widely disseminated, and from a relatively quiet expansion the poultry industry suddenly rocketed into big business. Since 1950, expansion in both egg and table poultry production has gathered momentum, and from producing 60 per cent of the eggs needed in the home market in 1939 the industry now produces practically the whole of the country's requirements for shell eggs, and is expanding into the processed egg market. In 1939 we produced approximately 77,000 tons of poultry meat, and imports amounted to 17,500 tons. Home production now amounts to approximately 215,100 tons and imports to 1,650 tons.

An interesting feature in the expansion of flocks for commercial egg production is that great expansion has taken place on the general farm. No doubt the availability of home-produced grain played some part in this development. Flocks on deep litter became the rage, and unused barns, cowshed and ex-army huts were pressed into service for this purpose. While the price of poultry food remained low and wages had not risen, these flocks were very profitable, in spite of the many teething troubles encountered. As the years went by, poultry foods increased rapidly in price, as did the cost of labour, and profit margins narrowed. Advice was eagerly sought on improved equipment and methods of management. Flocks for commercial egg production are now kept in well insulated, specially designed houses. Profit margins have continued to get narrower and, contrary to the general farm practice of cutting down when profit margins shrink, farmers are trying to maintain their income by increasing the number of birds kept. Now many farms have flocks of from 2,000 to 5,000 birds, and a sizeable number have flocks of over 10,000, with a few keeping more than 30,000 head of laying stock.

To increase the capacity of deep litter houses, complete floors of slats or weld mesh over pits have been installed. Feeding and watering arrangements are mechanized. Laying batteries have increased considerably and, with the advent of the small hybrid, it is quite usual for two or more birds to be accommodated in one cage.

Problems of intensive housing

The housing of such large numbers of birds in relatively small space has given rise to many problems. Ventilation and behaviour have had to be closely studied. Ordinary means of ventilation, such as windows and roof

ridges, were totally inadequate to cope with the amount of air to be extracted. In the newest poultry houses, great stress is laid on thorough insulation and positive ventilation, extraction usually being done by variable speed fans. Cannibalism has been rampant in many flocks, and the amount of light needed by a bird to continue as a profitable egg producer has been closely studied to find out just how little light need be given to achieve this purpose. Many of the newest poultry houses have no windows, and all light is supplied artificially. These houses are carefully insulated and ventilated, and even on the warmest summer day appear relatively cool. Nowadays it is not uncommon for a pullet to spend the whole of her life in such housing, and from the day she is hatched until the end of her year's lay she may never see the light of day.

With current production running at 100 per cent of consumers' requirements, even production of eggs throughout the year is called for. A premium is now paid for large eggs, and new techniques for the rearing of out-of-season replacement stock have been studied. Hitherto, pullets hatched during the winter months have matured too quickly and laid large numbers of small eggs. Producers have endeavoured to control the rate of maturity by restrictive feeding practices or increased grain feeding. Recent research has shown that the rate at which daylight is increasing has an important effect on the rate of maturity of the bird. On many farms this class of stock is now being reared in windowless houses with controlled light so that their maturity is delayed, resulting in the pullets producing bigger eggs when they start laying.

Economic pressure on commercial egg producers is now severe, and many farmers keeping medium sized flocks are finding it difficult to carry on. In the future it seems likely that, given full employment in our industrial country, only the farmers with very small or very large flocks are likely to continue. Medium sized flocks necessitating the employment of some labour cannot usually show a profit. The same remarks apply in large measure to the breeding side of the industry.

Broiler production

Before the war, table poultry production developed in areas easily accessible to main markets. This specialist industry has not been re-established in the post-war development. It was common practice for farmers to fatten a few batches of large cockerels for festive seasons. Whilst feeding stuffs remained relatively cheap, this practice continued in the post-war years. As food prices rose and production of the cheaper broiler increased, the production of large roasting chickens and capons has gradually declined. Some are still produced for the Christmas market but, in general, this section of the industry is declining in face of the fierce economic competition of the broiler, and it seems likely that so far as table chickens are concerned, except for Poussins and special occasions, the housewife's choice will mainly be boiler or broiler. The bulk of table poultry is now available to the housewife "oven ready".

Visitors returning from the United States were most enthusiastic about the possibilities of broiler production in this country, and expansion began cautiously in odd barns and disused army huts. These conditions were by no means ideal, but did give some indication of the possibilities of the industry,

which expanded fast and developed spectacularly. Broiler production is now carried out in buildings specially designed for the purpose, and if any part of the industry could be said to be fully controlled, this section is.

The group system has developed at a tremendous rate, with the nerve centre of the group either a packing station or a hatchery. Quite often food and housing concerns are also linked with the group. Speculative production of broilers is seldom practised, and as a rule chickens are sold before the hatching eggs are put into the incubator. The packing station plans its output for at least two years ahead, and the hatchery operating for the group has its bookings made out for an even longer period. As a constant flow of day-old chicks to the broiler producers is essential, groups tend to develop central breeding farms. On these farms special breeds and strains are developed, and usually crossed to produce the broiler chickens. General management, housing and feeding of the broilers are supervised by the group. At the start of the industry it was quite usual for broiler chicks (weighing about 3 lb) to be sold "killed and plucked", but so rapidly has the industry expanded that it was quite impossible for the retail trade to cope with the processing of these chickens. Processing is now carried out at packing stations, where the chickens are killed, plucked, eviscerated, packed and frozen, ready for sale.

An active publicity campaign has been carried on by the producers' organizations, and whereas roast chicken was once a rare treat, the housewife has become more interested in chicken and buys it more frequently. Interesting ways of cooking are publicized in the campaign.

Turkeys

Since the beginning of the present century, turkeys have become traditional Christmas fare. Before the war, entero-hepatitis (blackhead) had limited expansion, but research has produced effective control measures. Growth has been speedy, and whereas in the past it was customary to see flocks of turkeys gleaning grain after the harvest, most turkeys are now kept intensively in pole barns. Because of gapeworm infestation, many of these pole barns have slatted floors. There are indications that a group system, like that of the broiler industry, may develop.

Selective breeding for broader breasts has given rise to serious infertility, and artificial insemination has been increasingly used. The latest trend is the development of selected male and female lines and obtaining the desired conformation by crossing these. Turkeys normally lay in the spring and summer months, but by special management and lighting techniques breeders now produce hatching eggs at any time of the year.

Study of production costs has revealed different economic ages at which to kill turkeys, and increasing numbers of producers are now killing male turkeys at abour four months, whilst females are carried on and killed six to eight weeks later. Many producers have installed their own processing and cold storage plants, and rearing, fattening and processing are carried on for the greater part of the year. Most turkeys are now frozen and sold ready for the oven.

Though small-scale production of table ducklings is practised in many counties, the main production is centred in East Englia. Improvements in production and marketing methods have been achieved, but duckling pro-

duction has not expanded in the same way as that of broilers or turkeys. The production of geese has declined, and though there is a constant, relatively small production, expansion seems unlikely.

The great expansion of the poultry industry could not have taken place in its present form if great strides had not been made in the advancement of scientific knowledge. Much more is understood about nutrition, and with the physiology of the fowl receiving study, more useful information should be gained of the bird's environmental requirements. It is not uncommon nowadays for large breeding establishments to employ the full-time services of geneticists, and their skill has been exploited in increasing production. So the poultry industry, from being the Cinderella of agriculture, has advanced to a high place in agricultural output. Full use is made of the latest knowledge and computers are freely used in large breeding establishments to assess the value of their breeding stock. It seems likely that as the industry consolidates its advance, it will continue to streamline its production and make the most economic use of available materials.

FARM RENTS: A C.L.A. INVESTIGATION

The Country Landowners' Association has been collecting information from members about recent farm rental movements, and has obtained particulars of a large number of rent changes coming into effect since Michaelmas 1959. The data cover 1,870 farms and 375,798 acres in England and Wales. While this does not in any sense purport to be a comprehensive survey like the recent Cambridge University Survey in 1957, it is the biggest sample so far of the movement of rent since the provisions of the 1958 Agriculture Act began to operate effectively in regard to rents, and so is of special interest and value. The figures are being used by the N.F.U. as evidence of rental movements in connection with the next Price Review negotiations.

The summary is classified by counties and by methods of fixing rent. In 84 per cent of the cases covered, new rents have been negotiated with the sitting tenant; 1·6 per cent of the rents have been fixed by arbitrators; 10·4 per cent have been negotiated with new tenants; and 3·6 per cent result from lettings by tender.

The average new rents range from 62*s.* 10*d.* per acre in the case of agreement with sitting tenants to 89*s.* 9*d.* in the case of lettings by tender. Average new rents fixed at arbitration are 67*s.* 5*d.* and new lettings by agreement are 72*s.* 5*d.* The overall average new rent amounts to 64*s.* 4*d.* But the C.L.A. returns do not cover all counties of England and Wales; in some cases only one farm has been recorded for a whole county, and the sample is not weighted to conform to the national distribution of holdings in size groups. So the figures should be regarded with some caution.

Only one in four of the new lettings covered has been by tender. The average tender rent accepted (£4 10*s.*) is certainly not exorbitant, and the C.L.A. has evidence that it is exceptional for the highest tender to be accepted. Only 10 of the 67 farms involved have been let by tender at above £5 an acre.

While it would appear that farm rents are now going up appreciably, it must be remembered that they were formerly very low in relation to the landowner's increased costs and were, from his point of view, at an uneconomic level. The landowner still receives a very modest return on his capital investment in relation to the current value of the fixed equipment of farms. And rent now forms only about 7 per cent of the farmer's outgoings as compared with 17 per cent pre-war.

Agricultural Chemicals Approval Scheme

THE first list of approved products issued under the Agricultural Chemicals Approval Scheme (Insecticides, Fungicides and Herbicides) was published on the 1st February, 1961.* This voluntary scheme enables proprietary brands of crop protection chemicals to be officially approved. The Scheme came into operation on 1st June, 1960, when it replaced the similar Crop Protection Products Approval Scheme.

The purpose of the new Scheme is to enable users to select, and advisers to recommend, efficient and appropriate products. The chemicals covered are those used for the control of plant pests and diseases, for the destruction of weeds, growth regulation, and other crop protection purposes, but those used as rodenticides and for purposes other than crop protection are not included.

Approved products bear an official mark (reproduced here) which is an assurance that the claims made on the labels are based on sound experimental and practical experience, and that the product is efficient and suitable for the uses claimed. The mark may be used only on a product which has received official approval.

The products below have been approved since the present list went to press:

INSECTICIDES

DDT DUSTS
Chafer's Dustox DDT 125 Insecticide—J. W. Chafer Ltd.

DIELDRIN WETTABLE POWDERS
Shell 50% Dieldrin Wettable Powder—Shell Chemical Co. Ltd.

DIMETHOATE SPRAYS
Rogor 40—Fisons Pest Control Ltd.

DNOC/DDT WINTER WASHES
Dytrol DNC with DDT—Shell Chemical Co.

MALATHION SPRAYS
Cyanamid Malathion 60—Cyanamid of Gt. Britain Ltd.

"SEVIN"
Murvin 'Fifty'—The Murphy Chemical Co. Ltd.

FUNGICIDES

COPPER DUSTS
Chafer's Hop Dustox 240 Copper Fungicide—J. W. Chafer Ltd.

DICLORAN DUSTS
Allisan Lettuce Dust—Boots Pure Drug Co. Ltd.

ZINEB WETTABLE POWDERS
Murphane Wettable—The Murphy Chemical Co. Ltd.

HERBICIDES

2, 4, 5-T ESTER SPRAYS
Bramble, Brushwood and Nettle Killer—Boots Pure Drug Co. Ltd.

SEED DRESSINGS

ALDRIN-ORGANO-MERCURY DRY SEED DRESSINGS
Aldrex A—Shell Chemical Co. Ltd.

HEPTACHLOR-ORGANO-MERCURY DRY SEED DRESSINGS
Heptasan W. B.—Plant Protection Ltd.

*Copies may be obtained free from the Ministry of Agriculture (Publications), Ruskin Avenue, Kew, Richmond, Surrey; or from any of the regional or divisional offices and the main offices of the Agricultural Departments in Scotland, Northern Ireland, the Channel Islands and the Isle of Man.

Farming Cameo: Series 2

34. Chepstow, Monmouthshire

J. B. NOLAN, B.Sc.
District Advisory Officer

CHEPSTOW can truly be said to lie between England and Wales. The numerous castles in the area are evidence of its past strategic importance. In 1799 William Coxe wrote of Monmouthshire, as a whole, that "the natives of the western parts, which are sequestered and mountainous, unwillingly hold intercourse with the English, retain their ancient prejudices, and still brand them with the name of Saxons". In 1960 ancient prejudices have disappeared, and indeed visitors are welcome, for tourism is important in the area.

The Chepstow district, the south-east quarter of Monmouthshire, shares its eastern boundary—the beautifully wooded Wye valley—with Gloucestershire. In the north-east corner of the area lie the extensive forestry areas of Tintern and Devauden. From there the boundary runs westwards almost to Usk, then south to Newport and the coast.

Chepstow (Chepe-stow, the market place) is the principal town of the district, though the market itself is of local importance only. There is some light industry in the town, but with its castle, fortified wall remains, and racecourse, it has considerable tourist attraction.

In the south of the district, extending along the Bristol channel from Newport to Chepstow, lie the Caldicot levels or "moors". The soil of this coastal strip of marine alluvium is silty clay, derived from calcareous material.

The levels are bounded to the south by a sea wall and to the north by the 50 feet contour. The area is wholly permanent grassland, quite flat, with a maze of drainage channels known as "reens". Drainage is the limiting factor in this area; the main drainage system was laid down in the thirteenth century and has not materially altered since.

Before the second world war, the main enterprise on the moors was the provision of hay for the colliery ponies of South Wales, with some grazing of cattle. During and since the war, dairying has become the major enterprise and there are some notable herds in the area. On the whole, steadings are not well blessed with accommodation for stock and winter poaching is a big problem. As a result there is a trend towards loose housing. It could be here that slatted floors for cattle will find a place.

A final difficulty in this area is that holdings are fragmented. I am mindful of one 40-acre holding with no more than three fields in any one parish!

North of the moors is a region bordering the main Newport-Chepstow road. Lying for the most part on Carboniferous Limestone, the soils are a rich red brown, mostly deep and good working, and there is a fair proportion of arable land, in sharp contrast to the moors. A few holdings are mainly arable, but dairying is generally the main system of farming, with sheep for fat lamb production an important secondary enterprise on most farms.

In this area, originally one of fairly sizeable holdings, many smallholdings were created in the 20s and 30s, and today the 40-50 acre group is predominant.

These farms specialize in milk production to the exclusion of most other enterprises, and on many the intensity of stocking is very high, and they rely heavily on kale and short rotation leys.

Northwards again there is a belt of land, mostly on the brownstones of the Old Red Sandstone, which is poorer in quality, mostly sandy loams but varying in places to silty clay loams. In this area is a great deal of woodland, with the State Forests of Wentwood, Tintern and Devauden. The farmland, much of it at quite high elevation, 600 to 800 feet, is generally known as "hungry" land. Predominantly grassland, the only arable cropping here is for fodder production. Once a livestock rearing area, now milk production plays an important part in its economy, having been the salvation of the smaller farm.

Finally, in the north-west corner of the district, part really of the Usk valley, is a rolling, again predominantly grassland area of heavier loams overlying Old Red Sandstone. Although in this area milk production is important, the main emphasis is still on livestock rearing, mainly for store production and sheep. On the bigger farms there is also some summer fattening of cattle.

Of the cattle breeds, Herefords and Friesians predominate. The Friesians are making a substantial contribution now to the beef trade, most dairy farmers using Herefords to cross with all or part of the herd.

Sheep are to be found on most farms, one ewe to the acre is the traditional stocking rate in the lowland areas, where even the little dairy farms have their small flock. Cluns and Suffolks are used to cross with the draft hill ewes, either Welsh or Radnors, and ewes from the adjacent Forest of Dean. The ubiquitous black-faced ewe can be a mixture of all these.

Pigs and poultry are to be found on most farms, but generally as very subsidiary enterprises. There are a number of farmers specializing in the production of hatching eggs for a large hatchery near Newport.

The economy of the whole district is dependent on livestock and livestock products. This is not surprising when climatic conditions favour such a long season of grass growth. On many farms a high intensity of grassland production and utilization is found, and on the smaller farms, in particular, stocking rates are high.

Industry has so far made little impact on this part of Monmouthshire. Now the giant steelworks being built in furious haste on the moors at Llanwern will have a considerable effect on local agriculture and on the labour supply in particular.

Scenically, the area is of great beauty, and the woodland areas are its chief attraction, the Wye valley especially attracting many summer visitors. Tintern is the main centre, and the great Gothic abbey church is set to perfection by the nearby river and towering woodlands.

At the Farmers' Club

Prospects for Crop Improvement through New Varieties and Better Seeds

DURING 1961 special efforts are being made throughout the world, at the instigation of the FAO, to improve world food supplies by the more widespread use of good seed and new crop varieties. Appropriately, therefore, the first talk to the Farmers' Club in this International Seed Year was given on 11th January by Mr. Frank R. Horne, C.B.E., who as Director of the National Institute of Agricultural Botany has been closely in touch with work on crop improvement since 1945.

In the past twenty years, yields of cereal crops have risen in Britain by about 26 per cent for oats and by about 40 per cent for both wheat and barley. Although better use of fertilizers and the employment of chemical aids for controlling pests, weeds and diseases have helped to produce these increases, something like half the total improvement in cereal crops may be directly attributable to the use of new and better varieties, said Mr. Horne. "Very often seed of the best variety costs no more than seed of inferior varieties, but where an extra payment is required for the improved variety it is likely to be the best investment in agriculture."

Sometimes the improvement can be most economically obtained by breeding disease-resistant varieties, but certain problems are more readily overcome by means other than plant breeding, as for instance the use of chemical seed dressings.

Discussing the possibility of further improvement in our crops, Mr. Horne dealt first with some of the factors influencing yields. Leaf area is important, for this governs the plant's powers of building up dry matter from atmospheric carbon dioxide with the aid of the sun's energy. There is often room for improvement both in the amount of leaf and its arrangement so as to prevent shading of the lower leaves, he said. D. J. Watson of Rothamsted has calculated that with a plant capable of maintaining maximum leaf development from March to September the potential yield of dry matter from a cereal might be 14 tons per acre. "Unfortunately", added Mr. Horne, "there are many reasons why we are most unlikely ever to obtain yields of this order."

Yield also depends on the working efficiency per square inch of the crop's green surface, which can be improved by irrigation and by plant breeding, though increased efficiency achieved by the latter method in sugar beet was gained only at the expense of leafiness, so that the net gain was limited.

Some diseases seriously handicap the plant's capacity for forming dry matter so the N.I.A.B's tests on new varieties include a close study of their behaviour in relation to disease, under both laboratory and farm conditions. After three years' testing at many centres, outstanding new varieties go on the Recommended List, but confirmation depends on a further three years' trials. Most of the new varieties introduced into Britain are made available for N.I.A.B. trial before being marketed, but some are advertised and sold

without independent testing. Since this may not be in the best interests of the farming industry, the Committee for Transactions in Seeds recommended in 1957 that all breeders should be required by statute to submit new varieties for independent testing at least two years before offering them for sale.

Recent developments include new hybrid winter wheats from the Plant Breeding Institute that promise outstanding quality allied to Cappelle's high yields. But new high yielding spring wheats resistant to sprouting are still badly needed, and so are spring oat varieties giving high yields without lodging. In winter oats a combination of strong straw, stem eelworm resistance and high yield is required. In barleys, improved resistance to mildew, an earlier ripening variety similar to Proctor, and feeding barleys able to take heavy dressings of nitrogen fertilizer are the main needs.

Partial resistance to blight incorporated in some recently introduced potato varieties has proved effective in increasing yields in comparison with Majestic when blight occurs. With sugar beet, earlier sowing may increase sugar yield by 10-20 per cent, but low temperatures during early growth tend to increase bolting. Since Cambro was developed, however, bolting resistance has been greatly improved in commercial varieties. Monogerm and polyploid seed which produces more uniform crops, and new varieties tolerant to virus yellows, are currently on trial.

Development of new varieties of winter cauliflower giving a higher output per acre may follow the discovery of how temperature changes govern heading, and clonal propagation of both cauliflowers and Brussels sprouts should help in selecting and maintaining stocks of high quality varieties.

With maize, hybrids from north-west Europe (Inra 353, Caldera 402, Orla 266) do better here than those developed in warmer countries. The special method developed by Zaleski for obtaining fair crops of lucerne seed could well increase the already substantial success of this crop if it leads to the production of new varieties thoroughly acclimatized in different parts of Britain.

Among grasses, extension of the grazing season is one of the main needs. Some of the tall fescues collected by the FAO in North Africa, which are dormant in summer, are of particular interest. There is great scope for the increased use of the best named and certified herbage seeds—improved perennial ryegrass still forms only some 12 per cent of the total purchase by farmers. To help farmers in the choice and use of special-purpose varieties, it has been recommended that the variety name and salient characters should be declared for all seeds, not just for cereals, and that the terms certified or field approved should apply only to seeds produced under schemes run by independent authorities.

SYLVIA LAVERTON

Agriculture Readership Survey

We wish to thank all those readers who co-operated in the Readership Survey. Your response has been most heartening. The replies to the questionnaire are now being analysed.

Experimental Husbandry No. 5

THE fifth number of *Experimental Husbandry* was published on 19th January, 1961. This ournal is the chief vehicle for reports of experiments carried out on the Experimental Husbandry Farms and by the regional and county staff of the N.A.A.S. on commercial farms. It also offers a medium for papers of a "husbandry" as opposed to a purely scientific nature, from research stations. The current number reports a variety of experiments, from manuring of cereals to hormone implantation of lambs and from grazing of rye to a comparison of poultry housing system.

Many people will have seen in the agricultural press the contribution which Bridget's Experimental Husbandry Farm made to the Chalkland Farming Conference at Salisbury early last year. One of the papers here gives a detailed account of much of the work on which that contribution was based. Experiments with spring wheat and spring barley were carried out from 1955 to 1958. The spring wheat experiments showed that under good conditions at Bridget's the seed rate can be reduced to 2½ bushels per acre without loss of yield. The optimum level of nitrogen manuring for Atle wheat under those conditions was about 2½—3 cwt per acre sulphate of ammonia. The author suggests that the best method of applying this nitrogen is to give about half in the form of an NPK compound, combine-drilled, and the remainder as a top dressing as soon as possible after drilling. The barley experiments, using Proctor and Herta, showed the optimum manuring with nitrogen to be much the same as for wheat, with the most economic seed rate under good conditions about 2 bushels. Other cereal experiments, on heavy boulder clay at Boxworth, show how delayed sowing of spring wheat allows extra cultivations, with consequent destruction of many wild oat seedlings. So long as drilling the wheat was not delayed beyond the end of April, there was no loss of yield.

Experiments by Rothamsted, described in another paper, show that combine-drilled urea was consistently inferior to combine-drilled sulphate of ammonia for spring barley; also that heavy dressings of the former were more dangerous in checking plant growth. A survey carried out on Welsh farms over a three-year period shows that rye is very useful as winter grazing for dairy cattle but that, to gain the greatest advantage, the crop must be sown early. Besides a considerable saving in bought feedingstuffs, the grazing of rye makes it possible to allow grass to develop unhindered in early spring, with consequent advantages later in the season in the form of better grazing or an extra silage cut.

A paper describing a long-term experiment on grassland improvement methods at Great House, in the Pennines, besides giving information on various methods of treatment, also raises the now frequently recurring question of the unsatisfactory nature of many of the present methods of assessing the value of grassland.

In the realm of animal trials, one of the papers covers a number of experiments on the implantation of lambs of both sexes with hexoestrol and stilboestrol. Earlier work at the Rowett Institute and at Nottingham University is substantiated, with increased liveweight gains and a tendency to less fat in carcasses of weaned lambs implanted with these substances. Results from treating suckling lambs were inconclusive.

The phenomenon of hybrid vigour, that extra quality which is often found in cross-bred animals and which is an addition to their parents' qualities, has long been made use of by commercial breeders of pigs. In experiments at Terrington and Trawscoed two pure breeds and their reciprocal crosses were compared for bacon production. Although the performance of individual litters varied considerably and the results were by no means conclusive, there was an indication that the total litter weight at weaning and growth rate during the fattening period were better in the cross-breds than in the pure-breds. Further work will include the use of cross-bred sows.

Six years' work at Gleadthorpe, comparing four systems of housing laying hens, shows the consistent superiority of the battery system. Battery birds laid more eggs and ate less food to do so than birds kept in deep litter houses and under extensive colony and fold systems. Food consumption was highest in the fold units, and food waste in these units was also high. It is suggested that if the food troughs had been better protected, wastage could have been reduced appreciably.

This issue of *Experimental Husbandry* may be obtained from H.M. Stationery Office, or through any bookseller, price 5*s*. (5*s*. 5*d*. by post).

THE MINISTRY'S PUBLICATIONS

Since the list published in the January 1961 number of AGRICULTURE (p. 542), the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops or through any bookseller at the price quoted

BULLETINS

No. 132. Cabbages, Brussels Sprouts and other Green Crops (Revised) 3*s.* (by post 3*s.* 4*d.*)

Covers all aspects of growing and marketing, including preparation of the land, manuring, seed sowing and plant raising, lifting the crop and control of pests and diseases. Many varieties are mentioned, with notes about their particular requirements.

No. 70. Ducks and Geese (Revised) 6*s.* (by post 6*s.* 6*d.*)

Takes the reader step by step through the earlier stages of choosing breed, breeding methods, management of adult stock and finally marketing of eggs and birds. A general section includes information on by-products and diseases, and a chapter is devoted to ornamental waterfowl.

No. 154. Grassland Management (Revised) 4*s.* 6*d.* (by post 4*s.* 11*d.*)

A survey of all aspects of managing grassland—whether leys or permanent pasture—including detailed descriptions of cultivation methods, maintenance of soil fertility, manuring and establishment. Sections are devoted to the special problems of the management of grassland on mixed, general dairy and feeding farms, and hill sheep and cattle grazings.

OTHER PUBLICATIONS

Experimental Husbandry No. 5 (New) 5*s.* (by post 5*s.* 5*d.*)
An article about this issue appears on p. 597.

LEAFLETS

Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 5d.)

ADVISORY LEAFLETS

No. 286. Chrysanthemum Midge (Revised)
No. 487. Introducing Outdoor Irrigation (New)
No. 488. Management of Ware Potato Stores (New)

FIXED EQUIPMENT OF THE FARM LEAFLETS

No. 9. Grain Silos (Revised) 9*d.* (by post 11*d.*)
No. 43. Use of Concrete on Farm and Estate (New) 1*s.* 3*d.* (by post 1*s.* 5*d.*)

FREE ISSUES

Obtainable only from the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey.

FARM SAFETY REGULATIONS

Leaflet APS/3. Poisoning by Agricultural Chemicals—First Aid Measures (New)

UNNUMBERED LEAFLETS

Seed Mixtures for Wales (Revised)

In Brief

JOHN CHERRINGTON ON AMERICAN FARMING

"No American farmer will farm land which is difficult" said John Cherrington when giving an illustrated talk to a meeting at Mere, Wilts, on 9th January. The meeting was organized by the Mere and District Discussion Club in conjunction with the N.A.A.S., and Mr. Cherrington was talking about his recent trip to America on a Ford Foundation Scholarship.

The general tendency is for the farming in America to move to areas where the land is suitable and where to a large extent the climate is predictable and the water controllable. In Georgia 80 per cent of the land has reverted to pine woods and the farming is on a very low plain, whereas in California tremendous crops of potatoes (15 tons of earlies in 14 weeks), cotton, etc. are being grown by irrigating the "desert lands".

Mr. Cherrington emphasized, however, that this did not mean the American farmer is having an easy time; in fact, he works far harder than many of his British counterparts. There is very little hired labour on American farms and most of them are one-man units. This was emphasized by slides showing various types of equipment such as "worm feeding" for cattle and an ingenious bale loader for picking up lucerne hay straight from the field. Mr. Cherrington felt that if there is one thing we can learn from the Americans, it is the sensible use of controlled power.

Another point is that American farmers in general work on very small margins, especially in the broiler and beef fattening industries. In the latter most of the beef cattle are fattened on grain in yards (the grain often includes antibiotics, protein supplement etc.). This is possible because the cattle are of pure beef breeds, maize is cheap and the finished product worth rather more than in this country. Even then the margin tends to be rather less than £5 per head.

F. J. Thomas.

SPRING CEREALS ANNOUNCED BY N.I.A.B.

A new name appears in the 1961 N.I.A.B. spring barley list—the early-ripening German variety Union. It is mildew-resistant and, although it ripens several days earlier than Proctor, its yield is almost as good. The straw is a little longer than Proctor but of equal stiffness. For malting, however, Union is inferior to Proctor.

Two other new spring barleys have been approved for the list when seed becomes available. They are from the Plant Breeding Institute, Cambridge and have not yet been given names. Both are promising malting barleys. One is early in ripening and superior to Maythorpe both in yield and standing power. The other is late-maturing but is mildew-resistant, with stiffer straw than Proctor. Maythorpe and Provost are transferred to Category O as varieties becoming outclassed. The names of the two old favourites Plumage-Archer and Spratt-Archer disappear from the list, as also does Carlsberg II. Proctor remains the highest yielding of the malting barleys.

The only change in the 1961 spring oat list is that Sun II has been placed in Category O. Blenda meets the same need but is superior in several respects, while Condor remains the highest yielding variety. A new spring oat from the Welsh Plant Breeding Station, so far not named, has been approved for inclusion in the list when seed becomes available. As this is a long-straw variety which nevertheless stands well, it should prove a useful special-purpose variety for those who value oat straw. It also gives a good yield of high quality grain.

Spring Wheats		*Spring Barleys*		*Spring Oats*	
Jufy I	G(N)	Rika	G	Condor	G(N)
Koga II	G	Proctor	G	Blenda	G
Phoebus	G(N)	Union	G(N)	Sun II	O
Svenno	G	Freja	S	Manod	G(N)
Atson	O	Provost	O	Maldwyn	G
Peko	O	Maythorpe	O	Milford	S
Atle	S	Earl	S		

G = General use: S = Special use: O = Becoming outclassed.
G or S followed by (N) denotes new recommendation of a variety on which trials are still in progress.

The N.I.A.B's Farmers Leaflets incorporating these changes, together with two new leaflets on varieties of kale and maize, may be obtained by sending a stamped addressed envelope to the Secretary, National Institute of Agricultural Botany, Huntingdon Road, Cambridge, saying which leaflets are required.

APHIDS IN POTATO CHITTING HOUSES

It is well known that aphids transmit such virus diseases as leaf-roll and rugose mosaic from infected to healthy potato plants, and much attention is rightly paid to controlling attacks on growing crops. What is not so well known is that these harmful activities do not cease during the winter. Chitting houses provide ideal conditions for aphids to feed and multiply from December to March.

Some of the aphids in chitting houses may have entered through doors or ventilators: some may have been on the bulbs, lettuce or tomatoes grown in the house when it was not needed for potatoes.

In mild springs such as 1960 it was a common sight to see chitting houses full of winged aphids, and the sprouts of seed tubers covered with colonies of the wingless forms. At this stage, the potato plant is most susceptible to virus infection and there is little doubt that infestations in chitting houses contributed to the serious breakdown in the health of potato crops last year.

Not all kinds of potato aphids behave similarly in the chitting house. One species, the bulb potato aphid (*Rhopalosiphoninus latysiphon* Davidson), is a robust dark-green insect which shuns the light and is often found in large numbers inside potato clamps. It cannot transmit potato virus diseases, but by direct feeding it can cause the death of young sprouts. Continental workers consider it the chief pest of the chitting house. Other species are more important for their role in virus transmission than for direct injury to the potato sprouts. One of them, the peach-potato aphid (*Myzus persicae* Sulz.), is well known to farmers as the chief vector of virus yellows in the beet crop.

All aphids in the chitting house are injurious. Seed tubers should be inspected at frequent intervals and early action taken to prevent the build-up of large aphid populations.

Control measures involve the use of insecticidal smokes or sprays. Fumigating the chitting house with smokes containing gamma-BHC, BHC/DDT mixtures or malathion can be very effective. Care must be taken to make the house as draught-proof as possible, while the instructions accompanying the smoke canisters regarding dosage rates and application should be strictly followed. Smokes are more effective when the aphids are moving actively over the seed tubers, as they will if the temperature of the house is raised to 50-55°F just before and during fumigation.

An alternative technique is to spray the seed tubers in their boxes with a systemic aphicide such as dimethoate, using a hand lance with a long extension to a power-operated spraying machine.

R. Gair.

IN BRIEF

ARE YOU THINKING OF IRRIGATION?

A new advisory leaflet (No. 487), *Introducing Outdoor Irrigation*, will be of interest to many farmers, market gardeners and fruit growers. Water when and where it is wanted may be of first importance to higher crop yields, but there are other advantages. Jobs which may otherwise be impeded by dry conditions can be done at the right time; farms can maintain the rate of stocking during a drought and so make full use of the fodder produced during the rest of the year; a dairy herd can maintain milk yield without serious falling off during dry spells. Crops that respond well to irrigation include potatoes, sugar beet, grass, high value market garden crops, and, in the drier areas, fruit crops.

Satisfactory results can be expected only on well-drained land, and since the installation of irrigation equipment may involve costs ranging from £10 to £100 per irrigated acre, it is essential to see that drainage is adequate before a start is made.

The source of the water is often the principal factor accounting for the wide margin of installation cost. Thus, as the leaflet points out, the first thing to do is to get competent advice from the N.A.A.S. on the suitability of water supply, provision and construction of storage for water, the sinking of a bore hole, the possible restrictions on the tapping of underground supplies in the area, and the type and layout of equipment.

Different crops have differing irrigation needs, and the whole economy of an irrigation scheme depends very largely upon correct design and the labour likely to be involved in managing the system.

Single free copies of this leaflet may be obtained from the Ministry's Office at Ruskin Avenue, Kew, Richmond, Surrey.

SAFETY ON THE FARM: NEW REGULATIONS

Regulations which come into operation on 1st April, 1961 require certain safety standards to be maintained in places where agricultural workers are employed. The safety of stairways and floors is a general requirement: detailed requirements cover the construction of stairs, the provision of handrails for stairs or handholds for steep fixed ladders, and the guarding of openings in floors and walls or of edges of floors, wherever a worker might fall more than five feet.

Farmers are urged to have any necessary work put in hand without delay so that by 1st April full compliance with the regulations will be assured. The Ministry's Safety Inspectors, stationed at its divisional offices, and the Safety Officers of the Department of Agriculture for Scotland, are available to advise on necessary safeguards.

A leaflet explaining the requirements of the regulations can be obtained, free, from the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey, from any of the Ministry's divisional offices or from the Department of Agriculture for Scotland, Broomhouse Drive, Edinburgh, 11. Copies of the regulations (The Agriculture (Safeguarding of Workplaces) Regulations 1959, SI 1959 No. 428) can be bought from H.M.S.O. or through any bookseller, price 4*d*. (by post 6*d*.).

CHANGE OF N.A.A.S. DIRECTOR

Mr. J. A. McMillan, C.B.E., B.Sc. (Agric), who has been Director of the National Agricultural Advisory Service since August, 1959, is retiring from the public service this month.

Mr. McMillan is being succeeded by Mr. W. E. Jones, B.Sc.(Agric).

Book Reviews

Animal Husbandry Heresies. ALLAN FRASER. Crosby Lockwood. 16*s.*

Dr. Allan Fraser of Aberdeen is one of the great exponents of the sport of jousting, for which we may be thankful in a world of increasing passive acceptance; sometimes, perhaps, he tilts at windmills and occasionally he flogs a dead horse. He is mounted in this book on his well-known steed Environment, ready for the champions of Heredity and Genetics. Poor Bakewell is soon dismissed as one who failed with cattle and produced sheep fitted for the production of tallow candles. Pedigree is a matter for quiet titter, and there is no doubt many of us believe pedigrees because we want to do so: as the farm pupil said of the still-born calf, "Never mind, Sir, you still have the pedigree!" Nevertheless, despite the little—er—accidents, what could we substitute for the carefully kept records which have been built up honestly to bring order out of chaos? And surely, in 1960, the war of genetics and environment is not the sharp conflict it was in 1920? They are running well as a team these days.

There are excellent questioning chapters on the value of feeding standards such as starch equivalent and protein equivalent. Farmers should realise that such figures are compromises and not finality. The shriving influence of an Allan Fraser is particularly evident in his last chapter on protective foods.

F.F.D.

Farm Animals in Health and Disease. W. R. WOOLDRIDGE. Crosby Lockwood. 35*s.*

Everyone who is concerned with the health and productivity of farm livestock will find much to interest him in this book. A wide range of subject matter is covered in readable language, free from technical jargon, and one need not be deterred by the fact that there are more than 500 pages of print.

The first third of the book deals with general principles: "positive health" as opposed to mere freedom from clinical disease; ill health, its recognition, causes, and the resulting economic losses both to the individual owner and to the nation. The section concludes with an interesting chapter on the principles and methods of disease control.

The second and larger section is concerned with the more important diseases of domestic animals. It is patently impossible to deal exhaustively with the diseases of seven species in 350 pages and there is, inevitably, a lack of detail which in some cases might be misleading. This part of the book cannot be regarded as a textbook of veterinary medicine, but from it the inquiring layman should derive a reasonable working knowledge of the disease problems with which he may be faced.

Reading such a concise account of so vast a subject cannot fail to put the overall picture of health and disease, and the parts played in the maintenance of health by good husbandry, preventive medicine and clinical veterinary medicine into a clearer perspective. Far from tempting the reader to become his own veterinarian, the book should help all owners and stockmen to a better understanding of the work and problems of the veterinary profession and with this knowledge to make better use of its services.

A.J.D.C.

Farming as a Career. R. HUGH CROWLE. Batsford Ltd. 12*s.* 6*d.*

Many non-farming parents feel woefully ill-equipped to advise their children when they express a wish to seek a livelihood on the land. Appeals to Careers Masters and Youth Employment Officers often reveal an amazing lack of accurate knowledge of the subject.

The author of *Farming as a Career* has produced a well-balanced book which describes farming in this country and its many ancillary occupations. While he does not claim to have produced an agricultural textbook, he has broadly surveyed the prevailing farming systems, the main arable crops and the important livestock enterprises, including pigs and poultry, which indicate to young people the activities in which they might engage.

Stress is placed on the importance of physical fitness, a real interest in living things and a sense of responsibility in those wishing to take up farming as a career. The difficulties which have to be overcome in setting up in business on one's own account are dealt with realistically, and any illusions

concerning an easy life in the countryside are ruthlessly dispelled.

The different ways of entering the industry are set out, including the Agricultural Apprenticeship Scheme. The increasing importance of technical knowledge is emphasized and a full and accurate description given of the training available at different levels. Young people are reminded of the wide range of jobs, from the stockman to the scientist engaged in research, in connection with food production, all demanding a wide variety of training and qualifications. An appendix contains valuable information about training centres.

The book is easy to read, and should find a place in the library of all secondary and grammar schools, as well as on the shelves of all who have the responsibility of helping young people to choose their careers.

E.K.G.

Collected Papers: Summary and Subject Reviews. (Vol. XVI, 1960). Rowett Research Institute.

A list of scientific papers published by the Rowett Research Institute in the year 1958-59 is contained in this publication. It also includes a summary of these papers, written by the Director, Dr. D. P. Cuthbertson, the major part of which is concerned with the fundamental physiology and nutrition of farm animals. This is of considerable interest to research workers, but has little direct application to farm practice. A large part of the summary deals with the function of the rumen in the nutrition of cattle and sheep; rumen microbiology, nitrogen assimilation and reticulo-rumen movements being discussed.

A new experimental technique, which has been developed at the Institute, is the use of paper impregnated with chromium oxide as a faecal index. The marker in this form appears to be less subject to diurnal variation than when administered in capsule form.

The effect of level of phosphorus in the diet of sheep has been investigated, and it has been shown that small quantities of this mineral in the ration can result in depletion of bone phosphorus during pregnancy and lactation. Even when larger amounts were fed in mid-lactation, the earlier loss of phosphorus in the bone was not completely replaced.

Chlortetracycline, as a feed supplement for early-weaned calves, increased liveweight gain, concentrate consumption and conversion rate. It is suggested that this may be due to the antibiotic reducing gas formation in the rumen, and thus increasing the appetite of the calves.

Two reports are also included—one on lipid research and the other reviewing experiments on the nutrition of sows. In the latter it is pointed out that less is known about the nutritional requirements of sows than of most other categories of pigs. Trials on the energy and protein requirements of the sow, and nutrition during early life are discussed.

Copies of this publication are obtainable free from the Librarian, The Rowett Research Institute, The Reid Library, Bucksburn, Aberdeen.

J.C.M.

The Grower Annual, 1961. Crosby Lockwood. 25*s.*

If ever a book deserved a warm and wide welcome among horticulturists and keen gardeners, this is it. Gathered within its covers are 58 articles of pleasing diversity and, besides profuse illustration with black and white half-tones, there are some first-class colour plates which are as delightful as they are instructive. The reference section to N.A.A.S. and N.F.U. officers and horticultural associations is a thoughtful addition.

It is not possible to do justice to the articles and their contributors in a short notice. You should ask to see a copy at your booksellers'. I should be surprised if you don't buy it without a moment's hesitation.

S.R.O'H.

Plant Exploration, Collection and Introduction. R. O. WHYTE. FAO. Rome. H.M. Stationery Office, London, 5*s.* (5*s.* 6*d.* by post.)

When plant collectors went from Kew to far places of the earth nearly two centuries ago, their instructions were "to collect seeds of all new plants which may offer themselves for the use of the Royal Gardens at Kew". Nowadays some expeditions still set out to collect whatever they may come across to enrich our gardens, but more commonly they go with quite definite ideas of what they want to find, often to explore the genetic potentialities of a particular cultivated plant and its related species. Thus an expedition goes to find wild species of *Solanum*, and build up a collection with a wide range of heritable factors in the hope that such plants, mated with the

cultivated potato, may contribute useful characters, be it frost-tolerance or blight-resistance, which the potato at present lacks.

The systematic approach to plant collecting is the subject of this bulletin, the author of which, Dr. R. O. Whyte of FAO's Plant Production Division, is well known for his work on grassland and forage plants. After brief sketches of the origin and spread of eighteen cultivated plants, serving in the author's words as a background to the study, there follow short chapters on the principles and practice of this collecting; where useful species are most to be sought, what type and quantity of material is to be collected, the means of conveyance and the maintenance of a living collection of such plants.

Recent work on these lines done by various countries and by FAO is described. In the Commonwealth, chief credit goes to Australia for her systematic search, for herbage plants in particular, in lands with conditions comparable to her own climatic zones. The main concern of the booklet is to record what FAO is doing, and can do, to promote this kind of work. Plant exploration calls for international co-operation, and is an enterprise in which a body such as FAO can play an increasingly effective part.

Although this publication is to be regarded as an interim report of what is going on, rather than a complete manual of plant introduction, its good index and wide bibliography will render it useful for reference. Within the limits of its size and form, it contains much of interest, and can be recommended to all to whom the improvement of cultivated plants is a matter of concern.

T.A.R.

Chrysanthemums. EDWARD T. THISTLETHWAITE. Penguin. 6s.

The series of Penguin handbooks on gardening matters, prepared in conjunction with the Royal Horticultural Society, has proved an enormous success, largely because the editors have chosen their authors wisely, and invited only acknowledged specialists to contribute to the series.

Who could possibly have written a book on chrysanthemums better than Mr. Thistlethwaite, who for many years was Secretary of the National Chrysanthemum Society? The book is a little gem; no aspect of chrysanthemum culture has been neglected, and the advice is concise and authoritative. Mr. Thistlethwaite has packed into this little volume a wealth of information about chrysanthemums, both the early flowering and late varieties for greenhouse cultivation. We are also given a very valuable personal appreciation of 250 common varieties, stating in blunt language their merits and shortcomings.

There is a useful chapter on how to make the best of the entries at flower shows. Another fascinating chapter on "Sport and Seedlings", may enlighten those who are puzzled by the chrysanthemum's habit of producing, say, a yellow flower on a plant that we had expected would produce red, bronze, or white blossoms.

This Penguin handbook, like all its predecessors, is lavishly illustrated with pictures not only of the various types of chrysanthemum, but also of the many operations involved in the propagation and cultivation of the plants.

R.H.

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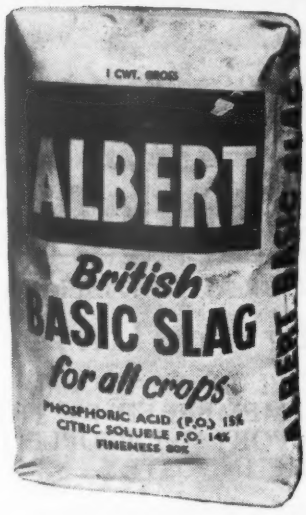

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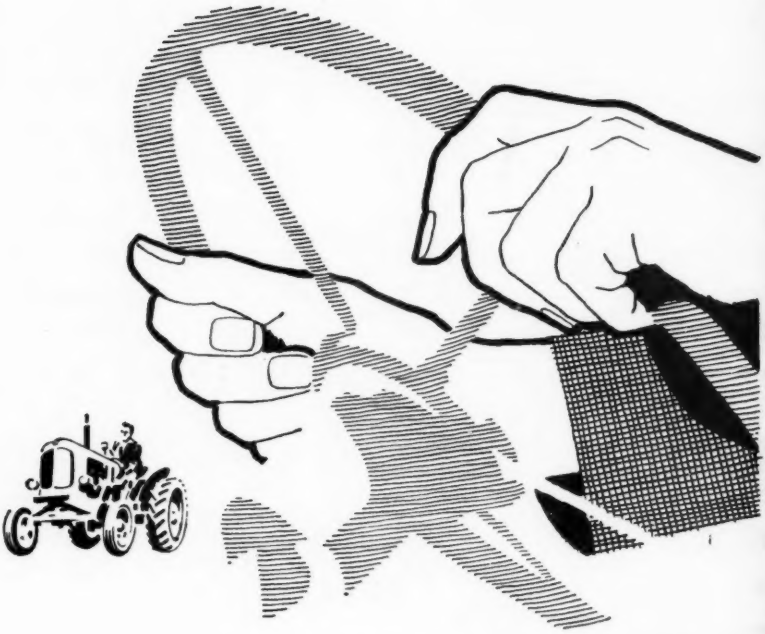

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